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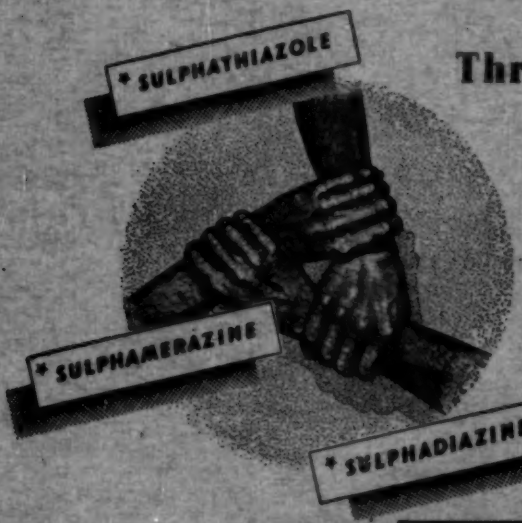

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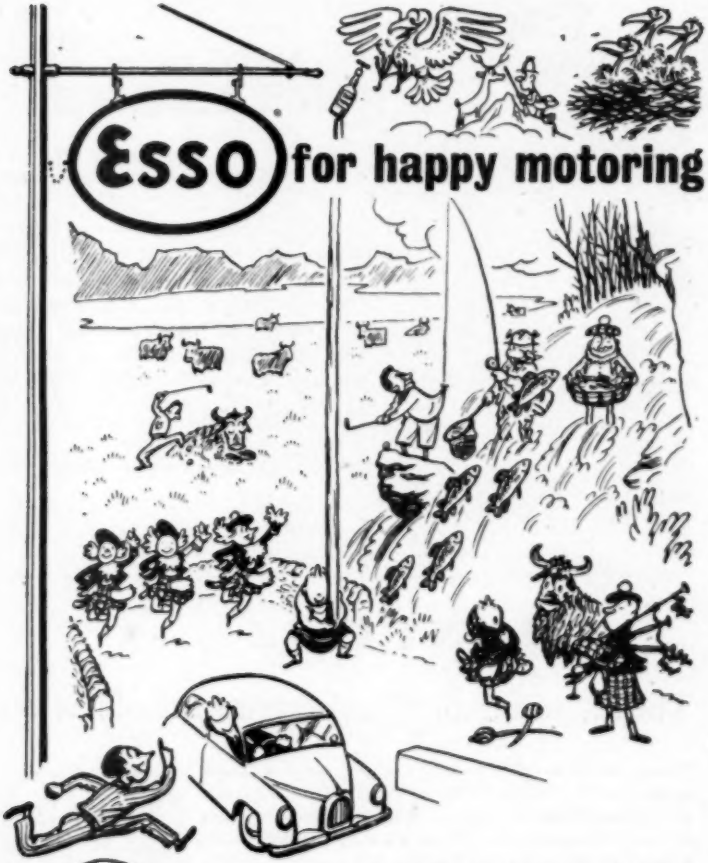

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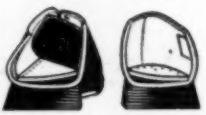

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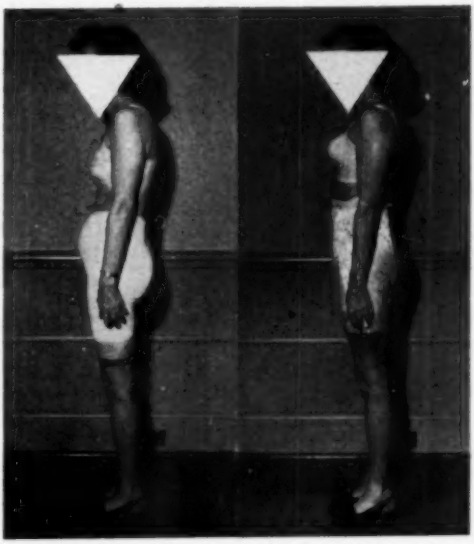

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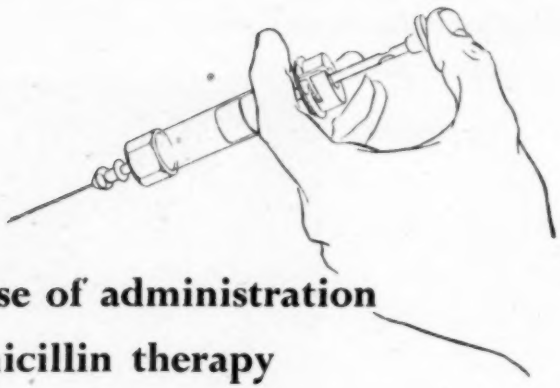

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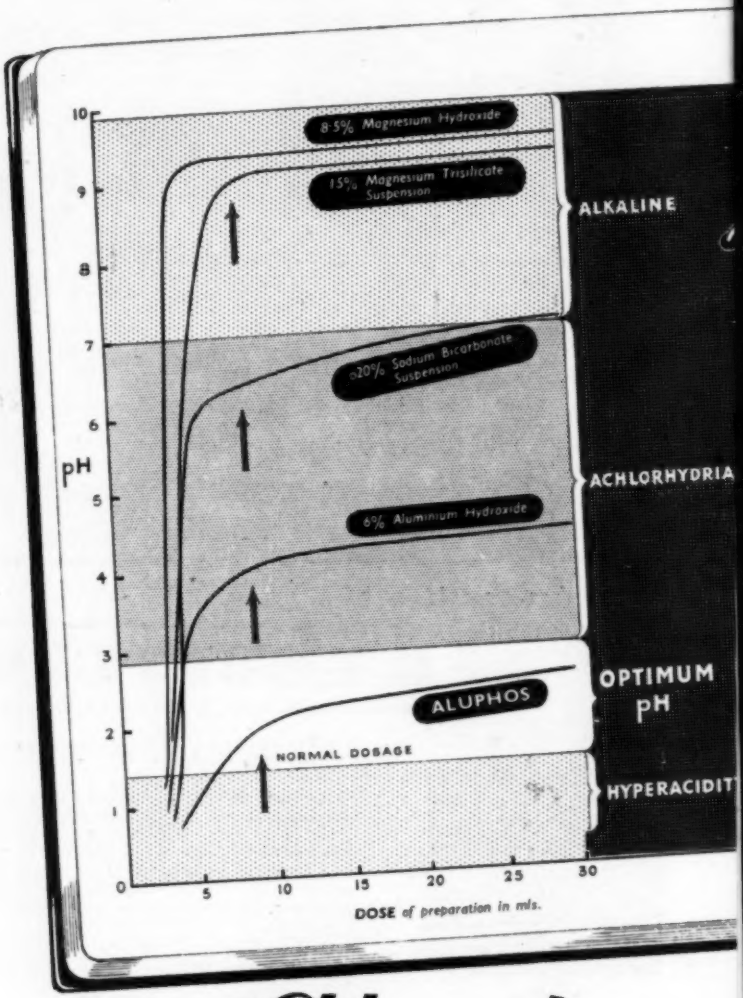

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Extract from 'British Medical Journal' February 10th, 1951, p. 292

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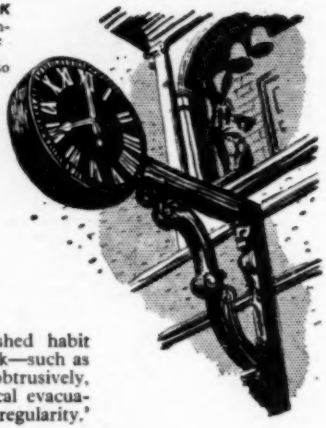

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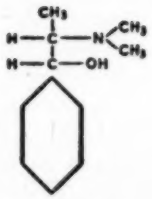

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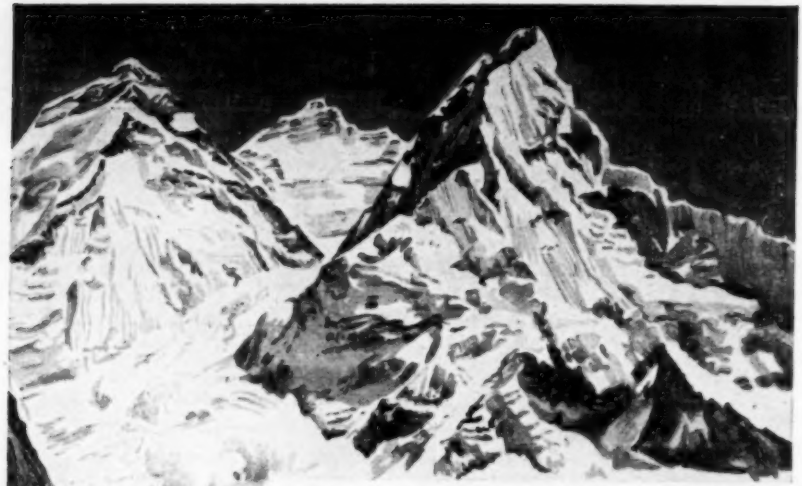

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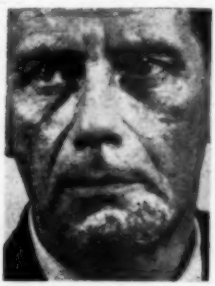

On the left: Mr. J. H., on October 5th, 1949, before treatment with F "99" for Obstinate Eczema of the face.
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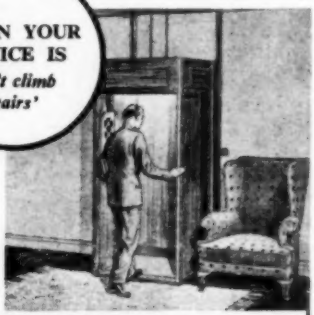

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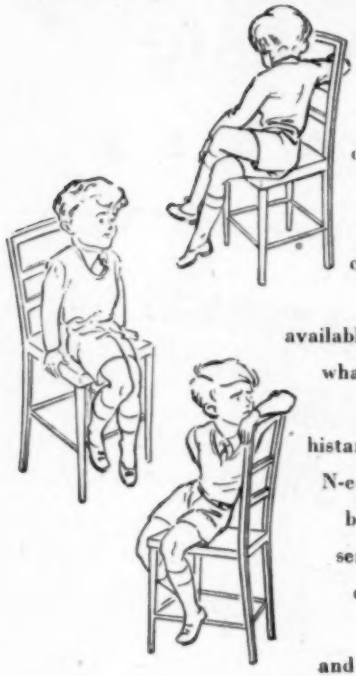
The problem of PRURITUS



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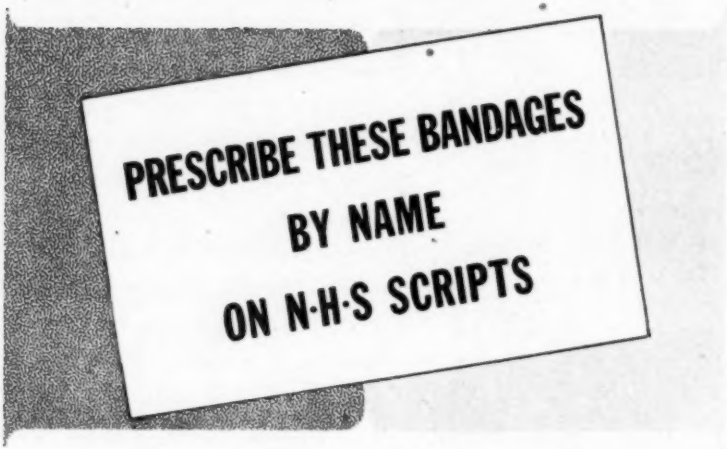

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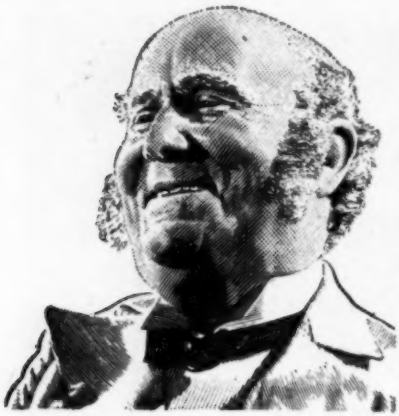

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Lancet, 261:1002 (Dec.) 1951.

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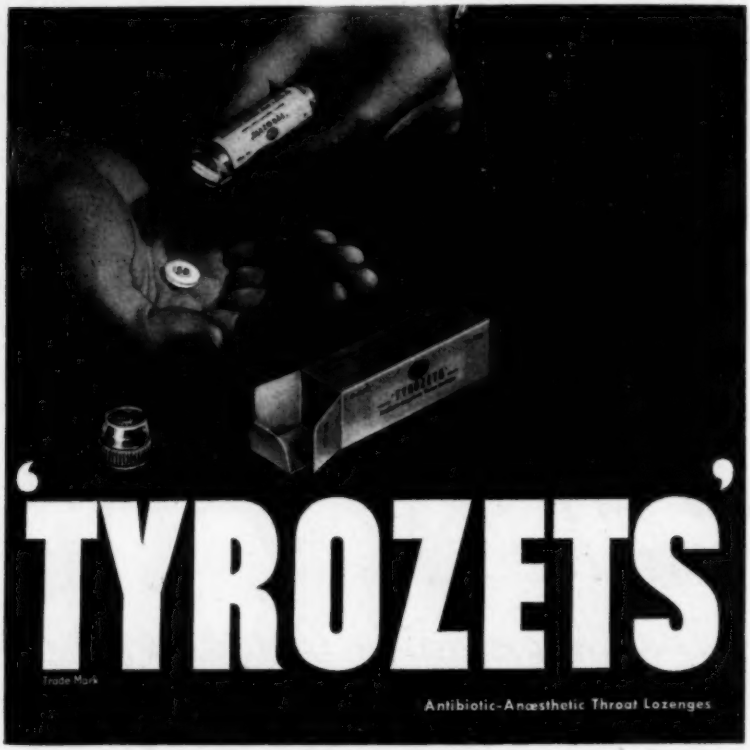

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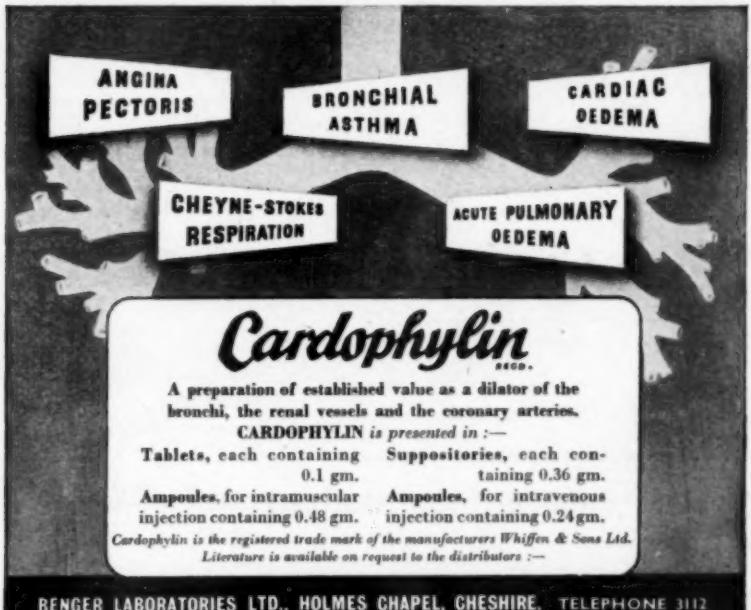
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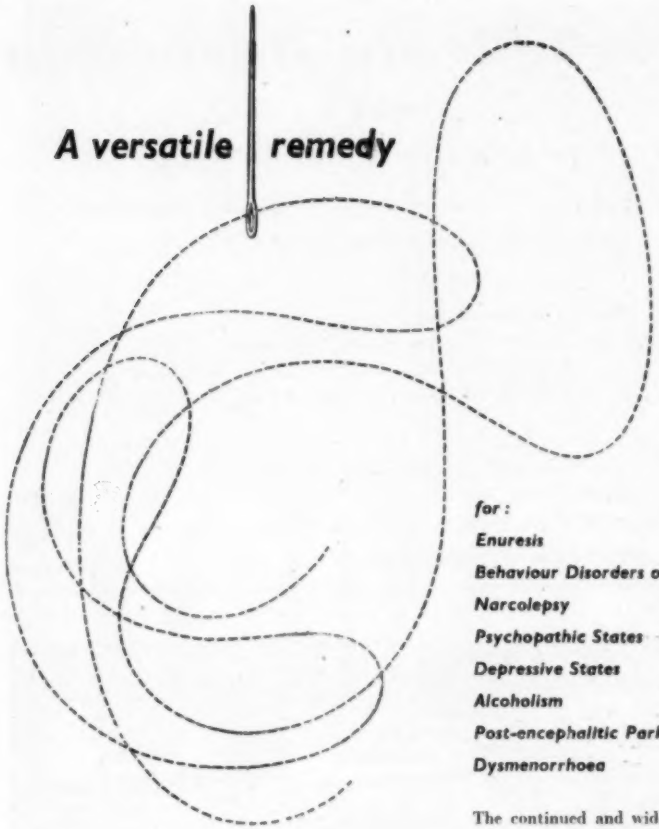

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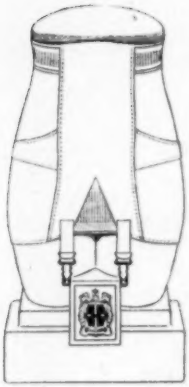

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This 'time-lag' has now been eliminated by the use of Lloyd's Adrenaline Cream.

Gentle massage over the affected myalgic spots with this cream brings rapid relief from pain and permits of more intensive treatment than would otherwise be possible.

Supplies of Lloyd's Adrenaline Cream are now available through Boots, Timothy Whites & Taylors, and all pharmacists.

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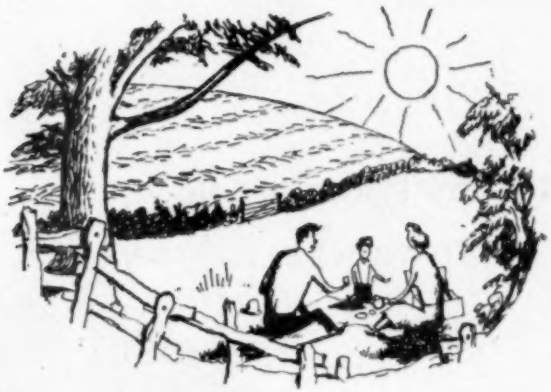

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The control of hay-fever still remains a problem, but whatever therapy is adopted the additional use of a nasal decongestant is invaluable.

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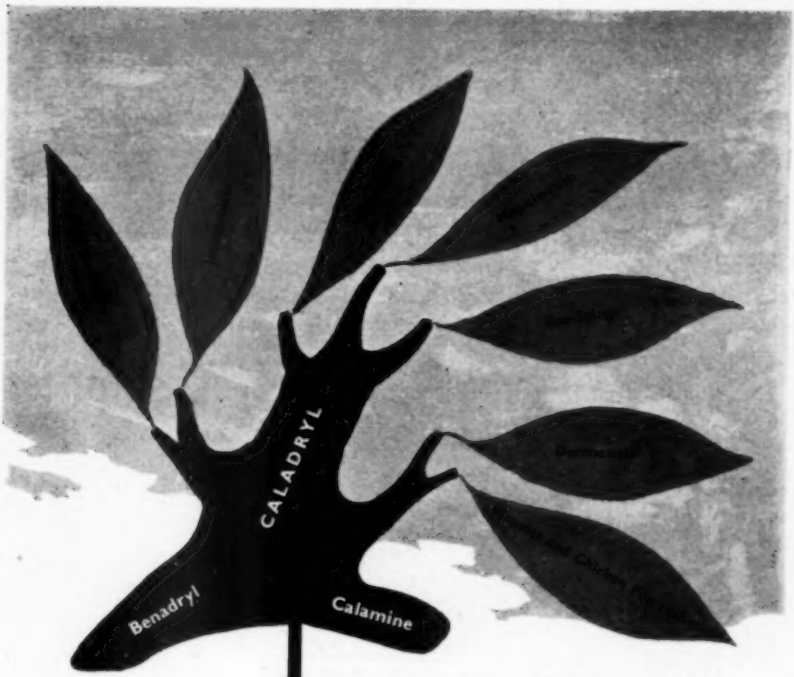

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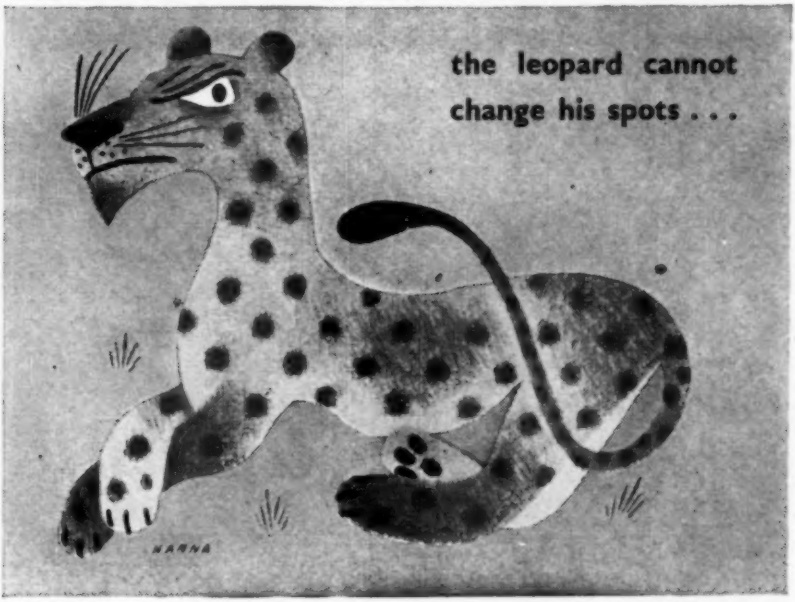

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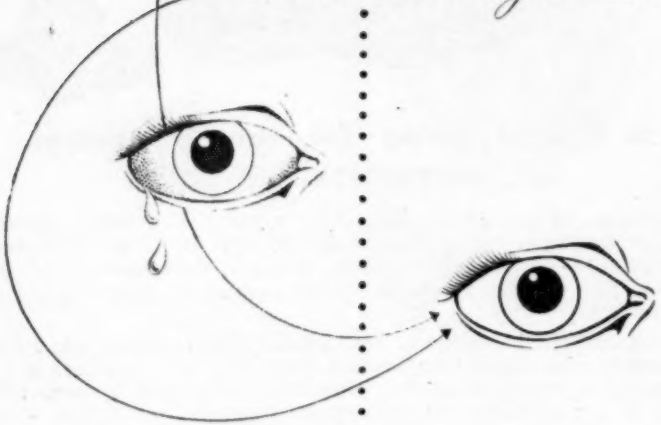
M.368

'HISTANTIN'

Relieves Hay Fever



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BRAND
Chlorcyclizine Hydrochloride

Designed for fewer side-effects, 'Histantin' is of proven value in the symptomatic management of hay fever. A single daily dose of this antihistamine is sufficient to keep most patients free from symptoms.

'Histantin' is available as 50 mgm. compressed products in bottles of 25, 100 and 500.

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THE PRACTITIONER

No. 1008 JUNE 1952 Volume 168

THE MONTH

The Symposium

SINCE the days of Hippocrates, medical climatology has undergone more 'rises and falls' than all the empires in the history of the world. In spite of all its vicissitudes, its frequent infiltration and even dominance by, followed by the equally frequent expulsion of, quackery—it has always maintained a strong position in the practice of medicine. The exigencies of totalitarian war in 1939-45 gave a fresh impetus to one branch of the subject—the medical hazards of extremes of climate—and finally placed these upon a sound scientific basis. In preparing the symposium this month our aim has been to summarize these recently acquired data, to correlate them with the older data, and to indicate their application to the health and welfare of the community both at home and abroad. Many problems remain to be solved, but the contributors to the symposium have made it abundantly clear that climate and environment have an important part to play in the promotion and maintenance of health.

The New Minister

THERE will be general regret that the contingencies of the political situation have made it necessary for Mr. Crookshank to vacate the Ministry of Health, but it has been clear for some time that even he, with his almost inexhaustible energy, has been asked to take on too much in combining the posts of Minister of Health and Leader of the House of Commons. During his short time at the Ministry he has shown a sense of values, an understanding of the profession's point of view, and a realistic (as opposed to a doctrinaire) outlook which has gone far towards restoring confidence in the National Health Service. That perhaps he did not show his usual mastery of detail during the stormy passage of the National Health Service Bill through the House was no fault of his, but of the original decision to lay on his shoulders the double task which he undertook on the establishment of the present Government. The choice of his successor, Mr. Iain Macleod, is a particularly happy one. Mr. Macleod has already distinguished himself as probably the outstanding authority in the Conservative Party on problems of health and national insurance, and during the recent debates in the House he has shown a mastery of the subject which has impressed members of all parties. With youth on his side—he is only thirty-eight—and the opportunity to con-

centrate on the work of what is now his own Department, there are good grounds for believing that he will be able to consolidate the preliminary work of his predecessor. If he shows the same understanding of the doctors and the patients of the country as he has already shown of the administrative and economic problems involved, the outlook for the National Health Service is more promising than it has been since its institution four years ago.

Johan van Riebeck

It was on April 5, 1652, that Johan van Riebeck established the settlement at the Cape of Good Hope which in the course of time was to develop into what we now know as the Union of South Africa. As van Riebeck was a member of the medical profession, it is only appropriate that the issue of our contemporary, the *South African Medical Journal*, published on April 5, 1952, should be devoted to the memory of the surgeon-founder of the Union. Van Riebeck was born in Culemborg in 1618, and received his medical education in Amsterdam. At the age of twenty-one he became a surgeon in the East Indian Company and his first tour of service was in the East Indies. The practice of medicine, however, did not hold this ambitious young man for long, and two years later he transferred to the administrative and commercial side of the Company. It was in this capacity that he left Holland in December 1651 to found the settlement at the Cape. He never divorced himself completely from medicine, however, and, as one of the main purposes for the founding of the settlement at the Cape was to try and ameliorate the havoc played by scurvy and other deficiency diseases among the sailors on the long sea voyage from Holland to the East Indies, his medical knowledge proved of great help in arranging for the sick seamen to receive adequate treatment when they reached the Cape. He remained at the Cape for ten years, and his work is summed up as follows by his biographer in our contemporary: 'As Governor it was difficult to equal him; as a medical man he did much for the health of the Colony. His stay at the Cape was one of the most important events in the history of South Africa'. It is therefore only appropriate that on the occasion of the tercentenary of the founding of the Cape Settlement we should pay tribute to the memory of the wayfarer from medicine who was the leader in this great exploit.

The 'Hopeless' Case

In 'The Management of the "Hopeless" Case', the Buckston Browne Prize Essay, 1950, which has now been published (London: H. K. Lewis & Co. Ltd., price 9*s*.), Dr. C. J. Gavey deals with an important problem in a manner which, whilst essentially practical, does not lack that philosophical background which is missing from so much of modern-day writings in medicine. 'Medicine remains an art which combines precise scientific truths with faith and the requirements of the soul'. It is against this background that he

discusses the problem, laying great emphasis upon the necessity for more instruction of the student in this, one of the most difficult problems in the practice of medicine: 'There is an ever-increasing proportion of medical students who have no medical, let alone other professional, family background, nor a classical education, which normally protect against substitution of material considerations for the abstract philosophical. A "generality of understanding" is required, based on study of the great Masters past and present'. It is because the more philosophical aspects of the management of the 'hopeless' case are dealt with in such detail that this book is of outstanding value. Sedatives, opiates, analgesics, stimulants—all these are fully discussed individually in all the textbooks. What has hitherto been lacking has been a unified approach to the problem—not the problem of the 'hopeless case' (and here, in the title, is our only criticism of Dr. Gavey's book), but the problem of the individual who has reached the terminal stage of life. All the analgesics and stimulants in the world are useless unless the patient's (and the relatives') hopes and fears are also being dealt with, and dealt with as only the doctor who understands human nature can deal with them. This is the task that Dr. Gavey has achieved so successfully. His book is one which every practitioner and senior medical student should possess, treasure, and study from cover to cover.

Telognosis

Our American cousins are insatiable in their search for new applications of modern inventions. Their latest method of short-circuiting space, time and manpower is telognosis, which is defined as 'the interpretation of fascimile roentgenograms obtained from distant sources by telephone or radio'. Telognosis has been in use in the United States of America since 1947, and a report has recently been published (J. Gershon-Cohen *et al.*, *J. Amer. med. Ass.*, 1952, **148**, 731) based on a year's experience of the method on a circuit established over busy commercial telephone channels between Atlantic City and Philadelphia, a distance of 60 miles. The apparatus consists of a transmitter that scans roentgenograms of any size up to 14 x 17 inches, and the receiver reproduces fascimiles reduced to half the size of the original films. Consultations and reports of the X-ray findings are made over the same telephone circuit as is used for sending the fascimiles, and these can be recorded on a dictograph. It is stated that 'there is no limit to the distance over which roentgenographic fascimiles may be transmitted. According to circumstances, either ordinary commercial telephone circuits or shortwave radio transmission may be used'. When the equipment becomes available 'it is anticipated that the costs will be low enough for the budgets of small rural hospitals'. On a comparison of the reports made on the fascimiles and on the original films 'no significant discrepancies' were found. It is considered that telognosis could be used 'as a means of teaching residents and fellows in radiology by

having them serve in small hospitals connected with a teaching center. This would give the resident a measure of responsibility without loss of supervision. This procedure then would serve a double purpose: (1) to train young radiologists without loss of expert teaching and supervision and (2) to insure expert full time roentgenologic service for the small hospital'. Other possible uses are to serve small military outposts, ships at sea, and in the remoter parts of Asia and Africa where radiological facilities are few and far between.

Radioactive Man

In these days of the increasing utilization, and prostitution, of radioactivity, it is useful to be reminded of the all-pervading distribution of radioactive substances. Much of this information is summarized in a report from the National Research Council of Canada (Martin, E. F., and Ferguson, J. K. W. *Canad. J. med. Sci.*, February 1952, **30**, 42). The main purpose of this report is to describe a new method and apparatus which have been evolved at the Atomic Energy Project of the National Research Council of Canada in Chalk River, Ontario, for the measurement of the very small amount of radon in human breath. By this method it was found that the radon content of expired air of 15 normal men after breathing radon-free air for ten minutes was 1.5×10^{-14} curie per litre, with a standard error of 0.24×10^{-14} curie. Radon, being a chemically inert gas, is distributed through the body fluids and tissues in concentrations largely determined by its solubility coefficients. Expired air is more suitable for analysis than blood or urine, and the amount of radon in the breath has been used to estimate the amount of radon in the bodies of workmen in the radium industries. The source of this body radon is widespread. All rocks contain measurable amounts of radium. As the radium decays, the surface layers of the earth are impregnated with radon which is given off into the atmosphere and the water. The radon content of atmospheric air varies considerably, depending upon weather conditions and the composition of the soil, and ranges from 0.7 to 4×10^{-13} curie per litre. If an intermediate figure of 2.3×10^{-13} curie is taken, this would contribute to radon in expired air 1 to 2×10^{-14} curie per litre of air. It has been estimated that there is 1.5×10^{-10} gramme of radium in the body; this would contribute a maximum of 2×10^{-15} curie of radon per litre of breath. The contribution of food to the radon in the breath would be 0.3×10^{-15} curie per litre from the radon in the food, and 1.7×10^{-15} curie per litre of breath from the radon dissolved in the food. The amount of radon obtained from drinking water would be negligible. Thus 'the radium level in the body plus the radium ingested with food and water would contribute about 4×10^{-15} curie per litre of breath', leaving the greater proportion to be supplied by atmospheric air.

CLIMATE AND THE DISTRIBUTION OF DISEASE

By R. PASSMORE, D.M., F.R.S.E., Lieut.-Col., I.M.S.(Retd.)
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As citizens of Edinburgh we can claim to write with experience of adverse climate. R. L. Stevenson, a great lover of his native city, has described our weather picturesquely but aptly as 'raw and boisterous in winter, shifty and uncongenial in summer and a downright meteorological purgatory in the spring'. We hasten to add that autumn, when our Festival is held, is usually delightful. Yet, all told, it is hard living. We survive, however, and even flourish. The annual report of our Medical Officer of Health shows that we are as healthy a people as many who live in the reputedly 'sunny south'. Scotland, like the rest of Britain, has very varied weather, but the whole country is set within one climatic region; hence the significance of local variations, however great in the etiology of specific diseases, is difficult to analyse. Our weather is mainly cyclonic in character. Variations in temperature, atmospheric pressure, humidity and wind velocity may be great over a short period of time. The very abruptness of the changes makes the analysis of their effects difficult. There is in this country one weather condition only which is undoubtedly and specifically responsible for an increased morbidity and mortality: a period of fog is always followed by an excessive number of deaths from diseases of the respiratory system. Much has been written and more talked both by the learned and the simple about other effects of climate on disease in this country, but in general, theories have far outrun facts. The uncertainties in defining and measuring the relevant factors in climate and in recording accurately disease incidence make assessment of their interrelationship difficult.

FOG AND DISEASES OF THE RESPIRATORY SYSTEM

Fog may occur in a number of meteorological circumstances, but its greatest significance to public health is in association with smoke over an industrial belt. Such a fog arises somewhat in this manner. Radiation from the ground surface may upset the normal vertical distribution of atmospheric temperature, and instead of a decrease of temperature with height an increase or inversion obtains. Although slight inversions occur on every clear evening, the quiet and settled anticyclonic air which covers the country in winter is especially favourable for them. The air above the inversion is 'denser' and

so acts as a lid preventing upward movement. Convection currents which would disperse into the upper atmosphere cannot operate, and so dust and smoke, both industrial and domestic, become entrapped in the lower layers. Evening cooling and the turbulence of the air cause the dew point to be reached. The clamminess of such a fog added to the particulate nature of smoke, creates the conditions to which the portmanteau word 'smog' has been properly applied. During the day the sun is unable to penetrate this blanket of damp carbon particles and so cannot warm the ground air and set up those convection currents which normally clear the atmosphere. Under anticyclonic conditions the inversion may extend up to about a thousand feet and, even without the protection offered by the particulate impurities of smoke, may last for several days.

Sir Alexander Macgregor (1947), a former Medical Officer of Health for Glasgow, has recorded examples of the effects of fog (smog) on mortality rates. Thus, following a fog of seventy-four hours' duration in Glasgow in January, 1929, accompanied by frost and influenza, the death rate rose to the high figure of 50.3 in the third week of the month as compared with 15.3 per thousand population for the whole year. When in February, 1928, Manchester had 13 days of fog, the death rate rose to 34.4 by the end of the month, as compared with the mean annual rate of 13.2 per thousand. The majority of this extra mortality was attributable to diseases of the respiratory system. Experiences in Glasgow have repeatedly shown that smog and frost occurring together form a sinister combination, disastrous to both extremes of life—to the young and the old.

More recently, a London fog has been studied by Logan (1949). His table, reproduced here, shows the effects of a fog which began on Friday, November 26, 1948, and persisted until Wednesday, December 1.

DEATHS REGISTERED IN LONDON (ADMINISTRATIVE COUNTY) DURING WEEKS 44-51

Year	Week No.							
	44	45	46	47	48	49	50	51
1945	593	639	638	707	739	734	907	979
1946	654	742	780	753	778	727	887	945
1947	739	771	742	799	721	861	817	779
1948	811	801	846	779	**1019**	944	891	738

The extra deaths during this period occurred mostly among those over the age of forty-five and were mainly attributable to bronchitis and pneumonia, although deaths from cancer and respiratory tuberculosis also showed slight increases.

There have been even worse experiences in the United States. Thus in 1948, Donora, a small industrial town dominated by steel, wire and zinc manufactories and lying on the Monongahela river about 30 miles to the

south of Pittsburg, suffered from one of the most startling smog disasters ever recorded. Ewing (1949), reporting the tragedy, said:—

> 'In addition to the 20 deaths, the illness of 5,910 persons—43 per cent. of the population—was caused by the smog which hung over Donora and the nearby community of Webster for five days beginning October 27, 1948. We can now say positively what couldn't be said before with scientific proof—that contamination of air in industrial areas can cause serious acute disabling diseases'.

What can be done to remedy, or at least to mitigate these effects? First, the initiative in the fight against smoke lies in the capable hands of the National Smoke Abatement Society, Chandos House, Buckingham Gate, London, S.W.1. The excellent work which this Society has already done in investigating new types of fuel, in the education of industrial firms and the general public in the better use of fuel, and in pressing for legislation to solve smoke problems, has already had beneficial results. Yet much more can be done, and to further their efforts they need the active cooperation of the medical profession. Doctors can and should give their support whenever an opportunity arises. Secondly, medical institutions should whenever possible be placed outside the main industrial areas. Convalescent homes, homes for the aged and hospitals for chronic chest disease should be beyond the normal range of city fogs. We cannot as yet alter the weather, the causal agent, but there are practical steps at the disposal of local communities which can reduce the outpouring of smoke and so lessen the pathological effects of smog.

THE GENERAL RELATIONSHIP BETWEEN CLIMATE AND DISEASE DISTRIBUTION

There are probably few diseases upon the distribution of which climate has no effect; for a moment's reflection will show that climate and climatic conditions determine in part the nature of the foods we eat, the quality of our sanitary methods and appliances, the structure of our homes and workshops, our social and family organizations, the viability of pathogenic micro-organisms outside the body, the viability and vitality of insects and other animal vectors which carry these micro-organisms, in a word, the major direct and indirect agents of disease. The relationship between climate and disease is therefore not straightforward, and it is not surprising that it is seldom possible to record accurately the influence of climate.

The epidemiology of cholera in India affords an example of the difficulties. Cholera is a disease in which the diagnosis is seldom difficult, even to the layman; it is caused by a micro-organism with general properties and powers of survival about which we are now relatively well informed: India is a country with extreme variations of weather which have been regularly recorded. Yet the cause of the rise and spread of epidemics is still unknown. Many theories have been propounded.

When the disease invaded Northern India in 1817 for the first time for many years, it found the Governor-General, the Marquis of Hastings, in camp with his army South of the Jumna. By a celebrated march 50 miles across country, he eluded the attack. Thereafter a wind-born theory of spread grew up, and until 1894, ten years after the discovery of *V. choleræ*, Army regulations laid down that troops when attacked by cholera should strike camp and march at right angles to the prevailing wind.

With the spread of knowledge of the bacteriology of cholera, the wind ceased to be considered a cause of its spread, but still the complete explanation of the growth of epidemics is not forthcoming. Sir Leonard Rogers (1928), after a long and detailed study, concluded that cholera epidemics were largely determined by climatic conditions and that a high level of absolute humidity was necessary for the spread of the disease. Sir Alexander Russell and E. R. Sundararajan (1928), after a long study of the association of the disease and climate, showed that, at least in certain districts, cholera was independent of relative humidity. But in some provinces there was a correlation with humidity, and in others there was a correlation with high temperature or rainfall. These two reports by acknowledged experts cover 379 pages; yet the only certain conclusions are that climate is in some manner associated with the spread of cholera, and the associations vary in different provinces and are always complicated. As recently as 1950, an expert WHO committee has called for further investigations into the relation between climate and cholera. Presumably the effects of climate, whatever they be, depend upon variations in the viability of *V. choleræ* outside the body in different seasons, and in its rate of dispersion in natural waters.

Problems of a similar order of difficulty occur in this country. It is a commonplace that practitioners are busiest in January and February and have most leisure during July and August. Much of the extra work in winter is associated with upper respiratory infections. In the cold weather the necessity of conserving heat compels us to reduce the natural ventilation in our homes and work places. Cold and lack of light curtail outdoor recreations and so perforce people are more crowded together. It is easier for micro-organisms to spread from man to man. Further, increased humidity may increase the viability of many micro-organisms, and a reduction of ultra-violet light improves their chances of survival. There have been no advances in air hygiene comparable to the new methods of water purification introduced during the last 100 years. Basic research with aerial disinfectants, however, has pointed the way to a possibly cleaner future.

Popular opinion holds that cold and damp increase individual susceptibility to infection. But at the Common Cold Research Unit volunteers have sat about in draughty passages, wearing damp clothes, and have been none the worse for the experience. Rheumatic disorders in all their manifestations have long been associated, both by the general public and the medical profession, with adverse climates. In particular, damp or sudden changes of

temperature have been considered as predisposing to rheumatism. The difficulties both in precise diagnosis of the disease and in measurement of a rapidly changing climatic environment have limited studies. If it is impossible to state in what manner external factors affect the connective tissues and bring about collagen disease, few would deny that sitting in a draught can bring about a stiff neck. Further, sudden changes in weather have often been associated with sudden changes in the clinical conditions of patients. Thus Mouriquand and Charpentier (1948) at Lyons on the night of September 20/21 noted that five out of six children with tuberculous meningitis, who had been steadily improving under streptomycin, suddenly developed violent headaches, restlessness and nausea. They consulted the meteorological data and found that a succession of four cold fronts had passed through on that night. The sceptical will, of course, ask for statistical proof of these associations and even then question the causal relationship; but most physicians will have seen striking clinical changes occurring in individual patients, simultaneous with weather changes, sufficiently often not to rule out such possibilities.

All will agree that the sun causes marked changes in our subjective sensations of health. Sick or well, we feel better when the sun is shining. None will deny the power of heliotherapy, but who can attempt more than a partial and limited account of its mode of action?

In the field of psychology, such conditions as suicide and alcoholism have a well-marked seasonal incidence, and are most frequent in the spring and at their lowest in mid-winter (Pullar-Strecker, 1952). Whereas peptic ulcers, supposedly closely associated with neurotic disturbances, are more likely to bleed and perforate both in spring and autumn and there are fewer deaths in the summer months (Card, 1949). The incidence of these conditions also varies greatly in different climatic regions. It is hard to believe that climate does not play some part in determining them. Undoubtedly warmth and too much sun promote lethargy and sloth; 'storminess' and extreme fluctuations of weather, vigour and drive. These last may be either a stimulus to achievement or become a nuisance to others. Both climate and environment play their part in the determination of national character. That initiative is a national characteristic of the Scot will certainly not be challenged by English neighbours. These psychological effects of climate also largely determine social organization and institutions, and so have a profound indirect effect on disease distribution.

That climate has a great effect on disease distribution is certain. But the effects are seldom direct and usually involve so many secondary considerations that scientific study has been extremely difficult and for the most part, hitherto, unprofitable. The subject has been a happy hunting ground for innumerable cranks and theorists, who often carry the seeds of their own downfall in over-emphasis of some factors at the expense of others. For the epidemiologist every factor *may* be relevant. In a short article it is im-

possible to do more than point out some of the problems in a subject that has fascinated many.

On the practical side, experience has shown that there are certain chronic diseases that are usually aggravated by residence in a hot climate. An understanding of these is a piece of useful knowledge.

DISEASES AGGRAVATED BY CLIMATIC FACTORS WHICH MAY RENDER PERSONS UNFIT FOR FOREIGN SERVICE

A tropical climate affects human disease distribution mainly indirectly through its influence on plant life and other animal life, especially insect life. Nevertheless, there are not a few chronic diseases which are often aggravated by heat and humidity and so render a sufferer unsuited to residence in the tropics. Some pathological conditions, which may be no more than minor inconveniences in temperate climates, can become total disabilities in the tropics. The Medical Services of the Armed Forces have the most experience of such conditions and the following account accords with orthodox practice in the Forces but, in general, it is applicable to persons wishing to go to the tropics in government employment, for missionary work, for commerce or, indeed, in any civilian capacity.

Skin diseases.—The regulation of body temperature falls more heavily on the skin than on any other organ. When the thermometer rises over 75° F. (23.9° C.) there is increased activity of the sweat glands, and this may affect adversely many skin diseases. One attack of an acute skin disease, which runs a short course and clears up completely, can be disregarded, but a history of chronic or recurrent attacks of most skin diseases constitutes a disability for tropical service. Specific chronic diseases contraindicating residence in a hot climate are: acne (in its severe forms with chronic indurated pustules), recurrent attacks of boils, cheiropompholyx, all forms of seborrhœic dermatitis, eczema, contact dermatitis, light-sensitive dermatitis, dermatitis herpetiformis, severe ichthyosis, lupus erythematosus, sycosis barbæ, recurrent urticaria, and angioneurotic œdema. Naturally in individual cases judgment may be difficult and risks may have to be taken, but any sufferer from these diseases must be told clearly that he is liable to become substantially worse in a hot climate

Endocrine disorders.—The endocrine glands play an important part in the regulation of body temperature. The exact rôle is not known and hard and fast rules cannot be laid down, but no one with a well-established endocrine disorder should be allowed to go to the tropics without careful consideration. In practice the problem is most likely to arise in persons with evidence of mild hyperthyroidism. They should always be warned that they will certainly feel the heat badly and that they run a real risk of developing symptoms of thyrotoxicosis. Natives of the tropics, however, appear to be far less susceptible to thyrotoxicosis than Europeans. Why this is so, is uncertain.

Urinary calculus.—In some tropical areas, notably north-east Thailand, parts of Pakistan and a few districts in Iran and China, the incidence of urinary stone is very high. In many other hot places, however, stone appears to be no more common than in colder climates. The general etiology of stone production remains unknown and is certainly not simple; but it is difficult to believe that excessive sweating, upsetting the fluid balance, may not be at least a contributory cause. It is therefore a sound general rule that persons with a previous history of calculus formation or of recurrent attacks of hæmaturia associated with oxaluria be barred from tropical service. Nevertheless, this is a rule which may properly be disregarded in persons of intelligence, able to ensure for themselves an adequate fluid intake and with no serious loss of kidney substance.

Bronchitis and asthma.—Experience in the hot, humid climate of South-East Asia during the war showed that all persons liable to bronchitis and asthma do badly in such a climate. Recently Dr. Poad (1952), who practises in Barbadoes, reports similar experiences there. Sufferers from these complaints who went to the island, sometimes on medical advice, to avoid the rigours of the British winter, have invariably become worse. Warm, dry climates, however, such as North Africa and Arizona possess, have long enjoyed a good reputation among sufferers with bronchitis and asthma.

We have already described the deleterious effects of cold, damp fogs on the respiratory system. Bronchitis and asthma are certainly not simple diseases and it is reasonable to suppose that it is the variety of unspecific particulate matter, inspired with the humid atmospheres, that irritates the respiratory passages. It is the 'cleanliness' of the air during the Egyptian winter which probably is responsible for its good repute.

The psychoneuroses.—For a European, tropical life imposes many mental strains. He is inevitably separated from his home and many of his family and cut off from some of his usual recreations. He must live and work with a people whose language and culture he can learn and assimilate only by long study and experience. Meanwhile their behaviour, which on the surface may seem quite irrational, often causes him endless frustration. In addition, owing to the heat and humidity, he may seldom be physically comfortable. It is a physical effort to move across his room; his shirt sticks to his back and sweat runs down his face. These constant physical irritations and strains contribute to mental tension and can lead to the breakdown of persons who are already emotionally unstable. It is certain that psychiatric disorders are responsible for a large amount of illness in the tropics—according to Colonial Office figures, just over 1 out of every 3 invalidings from tropical Africa. The Armed Forces in both war and peace have had experiences of a similar order. From our own observations it is clear that Missionary Societies, United Nations Organizations and commercial firms have similar problems. Both directly and indirectly a tropical climate imposes a severe strain on mental health. This may be well known and appear obvious to many prac-

titioners. Nevertheless, there is still much preventable individual suffering and general inefficiency directly attributable to unsuitable persons going abroad. The medical profession, as a whole, still does not pay sufficient attention to mental health: too many mentally unstable and weak people are being sent out to undergo the stresses and strains of an adverse tropical environment.

GENERAL CONCLUSIONS

Climate itself can directly produce disease (for example, frostbite and heat exhaustion), but these conditions occur only in special circumstances and their causes are clear-cut. Much more important are indirect climatic effects operating through food supply, general sanitary and social environments, and upon micro-organisms and their insect and other vectors. The geographical distribution of disease cannot be described in terms of climate alone. Each climatic region is essentially transitional in character and represents a stage between the humid heat of most equatorial regions and the dry cold of polar winds Hence it is impossible to delimit such regions with hard boundary lines. Likewise, the boundaries of disease distribution on maps cannot be sharply drawn. Climatologists have a contribution to make to the understanding of disease distributions. Their contribution can only be effective, however, if they work in close association with medical practitioners, epidemiologists, entomologists, bacteriologists and physiologists who understand the special problems which must be solved. At present, routine meteorological records are collected primarily for farmers and travellers. Climatologists may have to evolve new methods for the solving of medical problems.

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CLIMATE AS A THERAPEUTIC AGENT

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It is not difficult to supply plausible reasons for our relatively apathetic attention to the therapeutic possibilities of climate. Our grandfathers, and even our fathers, in medicine, enjoyed an era of tranquillity when their armamentarium was limited and conveniently static; when, free from the daily blandishments of manufacturing chemists, they had leisure to assess the value of the comparatively few drugs at their disposal; when with perhaps pontifical pomposity they expounded the minutiæ of dietetics; when their study of climatic peculiarities and the opportunities these afforded in practice were in striking contrast to those of the present-day physician.

THE INFLUENCE OF CHANGE

Our predecessors may have failed to recognize how much of the benefit they accredited to climate was due to change. For change in those leisurely days was more easily secured and more effective in its character and consequences. Once across the Channel the complete change in scenery, in language, in diet, and in currency, provided an immediate and attractive stimulus. The enormous increase in rapidity of transport, whilst naturally extending the range of travel, has greatly reduced its romance and also the influence of change. The necessary adjustment to local conditions and customs which originally possessed a considerable attraction has almost disappeared through the recognition of British conservatism and, for good commercial reasons, a ready acquiescence in our prejudices, our likes and dislikes. There is an ever increasing move towards uniformity; and if nowadays a drastic change is desired it is necessary to travel to almost unexplored territories.

When as a boy I visited the Continent, tea was quite unobtainable (or when rarely obtainable quite unrecognizable), and now the 'five o'clock' has been accepted almost everywhere: it was provided for me as a matter of course in the middle of the Sudan. I remember when considerable enterprise was required to procure an English newspaper, save as a curiosity, and perhaps this was as well in the interest of change. Now one hears grumbles because *The Times* is not available hundreds of miles from Printing House Square within a few hours of its publication.

One need not go so far afield to appreciate the influence of rapidity of transport upon change. It is within the memory of many of us when the dietetic peculiarities of our own counties were almost circumscribed through the absence of all but the most elementary transport. Recently I enjoyed a pineapple plucked less than thirty hours previously on the Gold Coast. Sixty years ago a tin of Devonshire cream would have been hardly more easily obtainable.

Familiarity we know breeds contempt; but since the natural peculiarities which are unalterable must still possess their therapeutic advantages, it may be as well to consider what these peculiarities are and how they may be employed in health and in disease.

THE ESSENTIALS OF CLIMATOLOGY

Climate is defined as the condition (of a region or country) in relation to prevailing atmospheric phenomena; or, as the result of all the solar and terrestrial influences and factors that affect animal or vegetable life. These factors include latitude; altitude; the amount of sunlight and of cloud, humidity, and rainfall; the strength and direction of winds; and the character of the subsoil, whether rock, sand, clay or gravel.

It is not to be supposed that in the study of climate as a therapeutic adjuvant a medical practitioner will apply himself to an examination of all these details, however interesting they may be to a climatologist. I recall the late Sir Henry Gauvain describing his exploration of the whole of the British Isles before he selected Hayling Island as the most suitable situation for his patients with surgical tuberculosis; but Gauvain was exceptional, if not unique. Nevertheless, the advantage of personal acquaintance with all the details and circumstances of a prospective resort can hardly be exaggerated, for these are valuable in assessing the pros and cons relating to a particular patient. In addition to purely climatic conditions, hygienic, dietetic, social and psychological factors may be of paramount importance. Dubious conditions that may be lightly considered or disregarded in the case of a robust pleasure-seeker may weigh heavily in the interests of a delicate subject for whom a long-term arrangement is contemplated. It may well be that the provision of a local physician conversant with all the peculiarities of a locality is by no means the least important factor that influences the choice. Clearly a compromise is often unavoidable, and in dealing with climate as such, only broad general principles are possible.

Notwithstanding the traditional criticism and abuse, the British climate is probably the best for health and longevity for the average person. Its variability and frequent abrupt changes are, however, badly tolerated by the invalid or the victim of chronic disease, whose deficiency of reserve and lack of resistance are best met by a climate with equable temperature, plenty of sunshine without heat, moderate humidity, and, of course, pure air.

Latitude hardly exercises the mind of an adviser unless he is prepared to consider the circumstances of neighbouring rivers and lakes, forests, and the like. Nor does the nature of the *subsoil* receive much attention although there is reason to suppose that apart from the obvious element of porosity there may be factors that influence health in some more or less elusive manner. Our predecessors paid particular attention to the character of the subsoil, particularly when advising the selection of a school; for whatever the basis of their deductions they recognized that certain types of adolescents developed better on one sort of soil and were constantly ailing on another.

I recall, too, the emphasis on this detail by an old teacher, a gynæcologist whose extensive experience accorded respect to an opinion, even if empirically determined.

Purity of air is self-explanatory for it means freedom from solid particles and irritating gases and depends upon distance from factories. Modern science has, of course, provided an explanation for 'miasmata'.

SUNSHINE

The influence of the sun upon the health and spirits has been recognized from the dawn of history. Apart from the stimulating effect that is provided by æsthetic contributions, brightness of colour, light and shade, which undoubtedly appeal to the majority of people, we know that ultra-violet rays have germicidal power as well as other properties which through endocrine stimulation and the influence upon metabolic processes are widespread in their influence.

Heliotherapy practised scientifically from the time of Finsen is now most intimately identified with Rollier at Leysin, where the graduated, carefully increased dosage of exposure is applied to all forms of tuberculosis, to rickets (now, of course, almost obsolete), to certain skin diseases, and to states which for want of a better term are described as 'debilitated'.

Little more need be said of sunshine beyond the reminder that too much is possible, as of all good things. In excess, the tonic effect is replaced by exhaustion: the production of pigment which is Nature's method of protection is an argument against prolonged and extensive exposure. Apart from the result of over-stimulation, depression often ensues from the experience of continuous perfect weather without storms.

ALTITUDE

The reputation of mountain air is deservedly well established. Altitude plays a part in various ways. Purity of air is naturally ensured. As density diminishes, respiration is increased and deeper breathing is almost universally beneficial, and especially in those subjects of pulmonary disease who are capable of the necessary muscular activity. Hæmopoiesis is stimulated—a feature of value to children and delicate subjects. In winter, mountains are warmer than the neighbouring lowlands.

Special advantages are claimed for alterations in atmospheric pressure; some asthmatics, for example, are free from attacks when living at a certain critical height apparently peculiar to the individual, above and below which they are not immune. It is difficult to explain such a circumstance, but the sensitiveness of the asthmatic subject both physically and psychically prohibits the denial of some as yet indefinable factor, whether physical or biochemical, as the responsible agent.

It must be remembered, however, that some people, quite apart from their physique and general health, are very susceptible to reduced oxygen tension and consideration has to be paid to this idiosyncrasy of dispro-

portionately violent intolerance of comparatively small heights. There are situations in Great Britain at an altitude of 1000 feet which for certain geographical reasons are more invigorating than places in Southern Europe three or four times that height.

WINDS

The most prevalent winds in the British Isles are those coming from the direction of the Atlantic, i.e., from south to west, with an increased incidence from the north east and east during the spring.

Just as alterations in atmospheric pressure influence the health and comfort of some 'human barometers', so there appears to be support for the traditional belief in the malevolent effect of the east wind upon the alimentary canal or, as it is popularly said, the liver. It may be that nothing more mysterious than change in temperature is responsible. 'Internal chills', so dear to the layman, are best accepted without attempting a more scientific explanation, for there is no doubt that exposure to cold is a potent factor in the production of functional dyspepsia in subjects of gastro-intestinal and vasomotor instability.

As a practical measure in choosing a resort it is more important to ascertain the conveniences afforded for shelter than the direction of the prevailing winds.

RAINFALL AND HUMIDITY

It is perhaps inevitable that undue attention is paid to the total rainfall when considering a health resort, but it is necessary to study the subject in more detail. When, as is generally the case, it is desired to be out of doors regularly, more crucial considerations than the total rainfall are the number of rainy days, the season of the year and the hours of the day when the fall is heaviest, and the condition of the soil, which if very porous may compensate for a profusion of rainy days.

As a broad generalization, a climate is either *bracing* or *sedative* (*relaxing*), a differentiation which is mainly determined by humidity. A sedative climate must comprehend a comparatively heavy rainfall and relatively little sunshine. There must be shelter from winds, especially in a coastal resort. Atmospheric variations are stimulating; quiescence engenders a laxity in the more or less robust in whom only too frequent changes induce fatigue. A relaxing climate makes little demand on the adaptative resources; it weakens resistance against infection because of lack of stimulus to the thyroid and adrenals. For the old and feeble in whom the reactive processes of the body are deficient, warmth and equability are essential and the absence of stimulation is an advantage.

BRACING AND SEDATIVE RESORTS

Many resorts in the British Isles possess a bracing quality at some time or other of the year. Examples are:—

In the spring, Cheltenham, Rhyl, Blackpool.

In the summer, Tunbridge Wells, Harrogate, Thanet.

In the autumn, Buxton, Cromer.

In the winter, Bournemouth, Felixstowe.

The selection of a resort with a *sedative* climate is a more difficult matter so far as home resorts are in question, for, as I have indicated, warmth and equability have to be purchased at the cost of disadvantages, particularly a heavy rainfall. When a prolonged stay is desired, compromise is essential when balancing the circumstances of a particular requirement. The best opportunities in the British Isles are:—

In the spring, the Cornish Riviera.

In the summer, the New Forest.

In the autumn, the Severn Valley.

In the winter, Cornwall generally.

If travel is practicable, Madeira and the Canaries are far preferable.

THE SEA

A *marine climate* has much to recommend it. The atmosphere is pure; the humidity, relatively slight. The temperature is moderate even in the tropics and is equable, since a great amount of heat is absorbed by the sea during the day and given back during the night.

A sense of invigoration is appreciable and contraindications are few, although idiosyncrasies may have to be accepted: some people suffer from insomnia; some from gastro-intestinal disturbances. Temperament, too, should not be ignored. During a long voyage the circumscribed environment, the lack of diversions and distractions may induce boredom and the danger of finding the advantages of sea-air subordinate to the attractions of the bar, which at sea is only too easy of access and a provocation to over-indulgence. The *sea coast* reproduces much of the climatic advantages of a sea voyage, particularly the moderate temperature and the mean humidity. The sea breeze by day and the land breeze at night are generally attractive. The east coast is dry and bracing; the west coast, milder; the south, mildest of all. Abroad, the Riviera, the Mediterranean and the Algerian coast offer greater advantages. It only remains to add a warning that a delicate child who does not bronze readily on exposure to the sun rarely does well at the seaside, and an inland resort is preferable.

THERAPEUTIC APPLICATIONS

Respiratory diseases.—Climate is particularly potent in its effect upon diseases and disorders of the respiratory tract, so that these loom largely in any therapeutic employment of climatology. Whilst the approach to early *pulmonary tuberculosis* is influenced by modern surgical possibilities, it is still open to question if, whenever possible, the prolonged stay at a moderate altitude does not possess the maximum advantage. Alpine resorts have a well-deserved popularity, since many circumstances besides pure air and appropriate altitude contribute to well-being and reconciliation to a protracted stay. In more advanced cases when activity is limited, altitude may

impose a dangerous strain. But, clearly, choice of a resort for a tuberculous subject will always be determined by individual considerations.

For the treatment of *asthma*, Le Mont Dore has an outstanding reputation. Altitude (3,400 feet) may play some part since the atmospheric conditions such as barometric pressure, electrical circumstances, and the like, that influence the production and relief of attacks are elusive; but in all probability the essential factor is a special air cure. *Hay fever* is in the same category.

Chronic laryngitis and *recurrent bronchitis*, especially of the dry type, are best referred to the Devon and Cornwall resorts—Penzance, Torquay, Sidmouth, for example; Madeira, the Canaries, Algiers and Egypt. In *bronchitis with profuse expectoration* a humid atmosphere at sea level is more suitable—Hastings, Ventnor, for example, although upper Egypt is, if practicable, better for a prolonged stay.

Emphysema demands attention more perhaps on the *cardiovascular* side for the indications are much the same, and will be met by a moderate elevation with level walks where graduated exercise can be comfortably sustained. Hindhead, Crowborough, or Malvern may be recommended. A special claim has been advanced for Llangammarch Wells on account of the barium content of its waters.

Compensated *valvular disease of the heart* requires little, if any, solicitude along these lines. As regards peripheral vascular lesions, it is not always realized how intense is the suffering from cold, especially damp cold, in those who, however good their general health, have an unstable vasomotor system with its influence on the peripheral circulation.

Chronic nephritis, with which may be conjoined *arteriosclerosis*, demands a warm dry climate which promotes the skin's activity. Sidmouth, Penzance and Bournemouth are the nearest to hand. Going farther afield, Madeira, Gibraltar, Majorca, the Canaries, South Africa, and British West Indies can be recommended. Assouan, on the edge of the desert, is particularly suitable during the whole of the winter.

Gastro-intestinal complaints of organic origin have no special climatic indication. In respect to functional disorders, it is probable that sanitation should be the prime consideration and solicitude. The subjects of lowered gastric and perhaps intestinal secretions are prone to parasitic and food infections. Psychology, too, plays an important part in the treatment of the nervous dyspeptic. The credit accorded to the routine imbibition of waters with alleged specific properties may have been unmerited; it was certainly exaggerated. The climate and attractive surroundings; the dietetic and hygienic routine and discipline, especially when imposed and conducted with impressiveness, may well have been the responsible factors. Any change of diet is a stimulus but, when a long-term policy has to be considered, an early attractiveness often gives way to resentment and a desire to return to the food that is habitually agreeable. A long sea journey is rarely appreciated by the chronic dyspeptic, to whom sea air is unsuitable. It is well to remember that there is a close association between the skin and the alimentary canal,

and that in choosing a resort for the dyspeptic, ensurance against the chills due to abrupt changes in temperature is, if not the first consideration, a very important one.

The Thanet coast has always been identified with the climatic treatment of *tuberculous adenitis* and *osteitis*, but it is unlikely that there is any specific advantage that cannot be found in many similar coastal resorts.

Rheumatism—using that term in its admittedly vague and non-committal sense—is best served by a dry soil and a warm equable climate. It is well recognized that 'rheumatic' subjects are barometric and peculiarly influenced by any climatic changes. As a rule sea air is unsuitable. A dry soil is an important consideration. The southern slopes of mountains are usually suitable, or, if distance is no object, Egypt, South Africa and Florida. Desert air is perhaps best of all.

It may be added that in addition to the character of climate in many of the well-known spas, the balneological and other forms of therapy available must influence one's choice.

NERVOUS DISEASES

Apart from the avoidance of complications there are no climatic indications regarding organic diseases, but functional conditions demand considerable attention to individual requirements.

A long sea voyage is of benefit in a purely fatigue state, especially if the patient can be cut off from the circumstances that produced his condition and provided with an environment where telephones cease from troubling and the markets are at rest. A sea voyage can, however, be the worst form of treatment for a psychotic, and many cases of suicide have been attributed to such ill-advised recommendation.

In general it is the circumstances and conditions rather than the climate that influence the choice. Is it rest or diversion that is required? It may be sufficient to select a bracing climate that encourages activity provided there is absence of noise. In other cases the provision of intellectual attractions may be the most important element, remembering that the very conditions that appeal to one are antipathetic to another who is relatively unsociable and prefers tranquillity.

CONCLUSION

Perhaps this rather elementary generalization is an appropriate commentary on the subject of climatotherapy as a whole: the necessity when recommending a resort to consider all contingent circumstances especially in these days of tension and anxiety.

BODY TEMPERATURE AND ITS CONTROI

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The temperature of the body is the balance struck between its heat production and its heat loss, both of which are under the influence of the nervous system, and especially of the heat-regulating centre acting as a thermostat. In all accurate work the temperature is taken in the rectum because the temperature in the mouth is subject to so much accidental variation. The breathing of cold air by the mouth may cause a fall of a few degrees and the drinking of hot fluids such as hot tea, which is commonly at 60° C. (140° F.), may similarly raise it. If the oral method must be used, the thermometer, even if it is a rapidly recording one, should be kept in the closed mouth for at least ten minutes. If the subject is in bed the possibility that his temperature is not raised unduly by hot-bottles or too many bedclothes must not be overlooked.

Commonly we say that the upper limit of the normal temperature at rest is 98.4° F. (or 37° C.), but patients inactive in bed commonly have a temperature one or two degrees below this. There is also considerable diurnal variation, the temperature being at its lowest in the early morning and at its highest between five and eight o'clock in the evening. It is not generally realized that the heart rate and the blood pressure show similar variations which appear to depend upon general sympathetic activity, and if the subject is exhausted, the variations are much less and may be absent. In some pathological states, notably sepsis, the diurnal variation is increased in an otherwise healthy patient with considerable reserves. In night workers the diurnal variations are reversed.

HEAT PRODUCTION

Heat is produced by every living tissue and is much increased when the tissue is active. The most important tissues from this point of view are the muscles. Heat production is the result of the oxidation of carbon and hydrogen, especially of the carbohydrates, fats and proteins. When we are asleep we produce heat at the rate of about 1,600 to 1,700 calories per twenty-four hours, or 40 calories per square meter of body surface per hour, one calorie being the amount of heat required to raise one kilogram of water 1 degree centigrade. For accurate work, reference to body surface is necessary (see heat loss). This is the basal metabolism or basal metabolic rate which is the heat production necessary for the maintenance of life. This is about as much as a 50 watt electric light bulb. When awake at a sedentary occupation about 2,500 calories are produced per twenty-four hours. Mental activity as distinct from wakefulness does not produce any increase, but muscular activity makes an enormous change. Moderate physical exercise increases the rate

to 4000 calories, and during short periods of intense activity a rate of 10,000 calories may be reached and the body temperature be temporarily increased several degrees. If the calorific value of the food does not equal the output, the subject must necessarily become thin, and *vice versa*. It must be realized also that anything which raises body temperature also increases heat production, as it increases all chemical processes. This may occur in hot countries and cause persons to become thin, and commonly it occurs as a secondary factor in fever from whatever cause (see p. 573).

Heat production is increased by the taking of food, especially of protein and by anything which tends to reduce body temperature, notably coldness of the external environment.

HEAT LOSS

Heat loss occurs from the respiratory tract, from the excretions, and especially by the skin blood vessels and sweating. It is therefore proportional to body surface. The tall thin person loses more heat than he who is short and fat, and it is for this reason that for purposes of comparison the calorific output is expressed in terms of body surface. Heat loss by the skin is most variable and occurs in several ways: by radiation, convection, conduction and the evaporation of sweat. The radiation of heat we appreciate from any hot, dark object; convection is the heating of air currents which are almost invariably present. Because of conduction, a piece of metal which conducts heat rapidly from the body feels colder than a piece of wood at the same temperature. Sweat we appreciate only when it is sufficient to accumulate on the skin, but invisible sweating is constantly going on. The amount we sweat in bed affects the volume and concentration of night urine.

The amount of heat lost by radiation, convection and conduction depends upon the temperature of the environment and is reduced when it is high. On the other hand, the evaporation of sweat is increased by high temperature but is dependent upon the humidity of the atmosphere. If the air is dry, evaporation is greatly increased. In humid atmospheres heat loss by sweating is much reduced, and this becomes a major problem in some parts of the world and in some occupations. In the latter much can be done to increase convection currents by suitable ventilation. It is evident therefore that in hot climates adaptability depends largely upon power of sweating, and in this there is great individual variation. It appears that the capability of sweating increases as a subject is exposed to heat, but if the exposure is too great or rapid, an exhaustion of the sweating mechanism may occur. When heat loss is inadequate, body temperature rapidly rises and the subject suffers from heat stroke.

Minor degrees of reduced heat loss occur in hot, overcrowded rooms, and may be experienced from wearing an impervious waterproof coat on a hot day. Excessive sweating is, however, not free from risks. Like excessive diarrhœa or vomiting, it leads to a loss of sodium chloride and, if prolonged by the drinking of water, may lead to coma and death (so-called water in-

toxication); this is prevented by the drinking of dilute saline. If water is not taken, sweating stops as soon as the blood concentration rises appreciably, and hence we have the paradox that, in such circumstances, a glass of cold water may cause, in a few minutes, profuse sweating.

Excessive heat loss occurs when the external environment is cold, when convection currents are increased, and when the blood vessels of the skin are dilated. Draughts may therefore lead to a fall of body temperature, as may also the taking of alcohol or an excessively hot bath, which actually paralyses the skin vessels.

THE HEAT-REGULATING CENTRE

All evidence points to the existence of an area in the region of the hypothalamus which is heat-sensitive. If the region is warmed artificially the body reacts as if it had been exposed to a warm environment. In an animal there is increased respiration and sweating of the paws. If the area is removed the animal becomes poikilothermic and rapidly loses heat. The exact nature of the heat-sensitive area is not clearly known, but we do know that mammalian synapses and neuromuscular junctions are highly sensitive to changes in temperature. In polypnœa, produced by increased temperature, there is a simple increase of the Hering-Breuer reflex, which is abolished by section of the vagus nerve, and the production of rapid, shallow breathing, particularly evident in the sheep and the dog. This has the effect of changing the air frequently in the upper respiratory tract without producing any over-ventilation of the lungs. The rapid, shallow breathing of lobar pneumonia is similar.

The heat-regulating centre is affected not only by the temperature of the blood but also by impulses which arise in the skin itself, for the compensatory changes, especially those of cold, can be shown to take place very rapidly. Thus a reduction of the volume of one hand placed in a plethysmograph takes place immediately the other is cooled. This was indeed one of the first observations ever carried out on the vasomotor system of man by Brown-Séquard in 1858.

THE EFFECTS OF EXPOSURE TO COLD

Exposure to cold leads to immediate conservation of body heat, sweating ceases and there is immediate vasoconstriction, not only of the skin, but also of the vessels of the mucous membrane of the respiratory tract: a fact which no doubt contributes to the 'catching of colds' when a rapid change is made from a warm hot atmosphere to one of cold, especially if the mucous membranes are not healthy and harbour bacteria. This constriction of the skin vessels is brought about, not only by increased sympathetic activity, but also by increased action of the adrenal glands; indeed, exposure to cold is the only known method of exhausting the adrenal medulla of animals, whilst animals in which the adrenals or pituitary have been removed are abnormally sensitive to cold. There is also increased metabolism, brought

about no doubt by increased activity of the thyroid gland, but the majority of this increase is caused by the fibrillary twitching of the muscles generally, which we call shivering. This is partly due to an increased activity of the central nervous system, but partly also to a direct action of cold upon muscle.

Local cooling of a limb markedly reduces its metabolism by reducing enzyme activity, and use has been made of this in surgery in attempts to conserve a limb when the main artery has been damaged and while waiting for the establishment of collateral circulation. Should the cooling be so severe as to freeze the tissue fluids, however, the cells burst and the phenomena of frostbite occur, and before that the liberation of a histamine-like substance of the skin, which leads, in normal skin, to reddening and blistering. Still less severe local cooling may lead to blueness of extremities because of the local stasis in capillaries produced by the shutting down of arterioles and venules.

EFFECTS OF EXPOSURE TO HEAT

Exposure to heat or increased heat production leads to the opposite state of affairs. Loss of heat by the skin is greatly augmented by vasodilatation and sweating and there is more rapid shallow respiration.

An essential feature of the mechanism for heat loss is an increased flow of blood through the skin brought about by arteriolar dilatation. No doubt many arteriovenous anastomoses open up. If the capillaries are also dilated there is flushed skin as in physical exercise, but in fever the capillaries may be constricted.

Normally, man conserves heat by wearing clothes, and their power of doing so bears no relation to their quality, but to their power of entangling air. Woven wool fibres, which keep their elasticity when crushed or wetted by the water vapour of the body better than most other fabrics, are particularly efficient in this respect, but voluminous garments which enclose large quantities of air are equally efficient. The benefit of a muffler is due to its preventing the exit of hot air at the neck. The qualities of the modern string undervest of the Navy have to be experienced to be believed.

Fever is the typical sign of bacterial invasion; since it is not produced by hyperthyroidism and mild degrees of exercise which greatly increase heat production, it must be assumed that it is produced initially by a reduced heat loss, which at an early stage may be associated with a cold, pale skin. As body temperature rises, however, heat production is increased; therefore a state is produced which makes it appear that the heat-regulating centre is set at a higher level than normally, for the body will still respond to exposure to heat and cold. The reduction of the heat loss is due to a reduction of the blood flow through the skin and is commonly associated with blood concentration. There must, however, be another factor concerned, possibly an effect of the toxin on the heat-regulating centre, for however much is drunk, the taking of fluid, although indicated in therapy, does not abolish the fever.

THE DELETERIOUS EFFECTS OF EXPOSURE TO TROPICAL ENVIRONMENTS

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A HUNDRED and fifty years ago the merchants of Calcutta used to meet at the end of the summer to celebrate the simple fact of their survival. The headstones which still stand in the cemetery give a vivid impression of those who were cut off in the prime of their youth. Thirty-five years ago catastrophes of heat stroke in Iraq focused more general attention on the dramatic and lethal effects of exposure to tropical environments. Since then knowledge of the physiology of heat production and heat loss has enormously increased, due in part to the demand of American citizens for central heating with all that that implies in the regulation of ventilation and humidity, and in the investigation of the environmental conditions which determine the feeling of comfort. The details of physiological knowledge are becoming more and more relevant to clinical practice in many fields, and nowhere is this more true than when considering the deleterious effects of tropical environments, as this article will show.

THE VARYING KINDS OF TROPICAL ENVIRONMENT

In the desert during the day the air temperature is much higher than normal body temperature. Simple conduction and convection must therefore add heat to the body. So must radiation, since the earth, a poor conductor of heat, is rapidly heated by the sun and must radiate heat to anything cooler than itself, such as the human body. There is only one way in which heat can be lost and that is by the evaporation of water from the surface of the skin. Fortunately for us the evaporation of water consumes a relatively large amount of heat (the latent heat of vaporization is high), for evaporation must not only take care of the heat being produced all the time by the body, the metabolic heat, but must remove in addition the heat added to the body by conduction, convection and radiation. The desert air is hot and dry and its evaporative ability is large, so that the skin need not appear wet, even though the sweat rate is high. But sweat the body must, if its temperature is not to rise.

In the desert during the night the air and earth temperatures drop rapidly. The night becomes unpleasantly cold—perhaps a better reason for the Bedouin robe than that traditionally given, insulation against the midday heat. The cold night is a safety valve in several ways. The sweat glands are rested, and the depletion of body water and salt caused by sweating may be restored. The skin temperature falls and with it the temperature of the subcutaneous tissues, an appreciable fraction of the body's total volume. The

internal body temperature which may have been raised falls to what we usually consider a normal level. The next day therefore may be faced with a certain reserve of storage capacity for heat, lessening the need for complete removal of metabolic heat.

The other extreme of tropical environment is the jungle. There is little difference between the day and night temperatures of earth and air, and the sun is rarely seen. The air temperature is less than body temperature so that some heat can be lost by radiation and convection. The air is almost saturated with water vapour so that sweat forms uselessly on the surface of the body, only to drip off unevaporated, failing therefore to help the body to lose heat. The skin is continually wet but the volume of sweat actually secreted is much less than in the desert. Preservation of the body temperature now depends not upon the ability to secrete large volumes of sweat but on the exact air temperature and the wind velocity. At an environmental temperature of 85° F. (29.5° C.) for a naked man (at a lower temperature for a clothed man), insufficient heat can be lost by radiation and convection, and sweating begins and continues. But if the air is still and saturated with water vapour it cannot evaporate any sweat and the body temperature must rise degree for degree as the air temperature rises. Air movement improves things, for if the air is not quite saturated, i.e., is able to evaporate any sweat at all, then the more frequently the air around the body is changed the greater the evaporation and hence the greater the cooling effect. In a jungle climate there is no resting period at night for the body to restore itself; indeed night may sometimes be worse than day, for air movement is often less.

These two extremes of tropical environment, the desert and the jungle, have been contrasted because they illustrate the extremes of physiological behaviour necessary to preserve a normal body temperature, and because their deleterious effects are often very different. It is fortunate for mankind that few places are both very hot and very humid, like the shores of the Persian Gulf. In general, the climate of any locality may be classed as predominantly jungle or predominantly desert in type. Within the true tropics the former predominates, as in Central America, on the West Coast of Africa, in Malaya and the East Indies and South Seas. Desert climates are usually found inland and just to the north of the Tropic of Cancer or the south of the Tropic of Capricorn, but in many places, due to local geographical features, the climate may alter markedly over a few miles. It is clear that there is no one thing which can be called a tropical environment and that general principles can be applied only if attention is paid to details of air temperature, humidity and movement. Florence Nightingale, for example, insisted on opening windows in hospitals in India. But in a desert climate the windows should be kept shut during the heat of the day in order to keep in the relatively cool night air and keep out the air which is being heated by the midday sun. In a jungle climate, on the other hand, the freer the draughts, the better all day and night.

FACTORS MODIFYING THE EFFECT OF ENVIRONMENT

The only way in which the physical environment can be modified is by alterations in clothing and housing, and housing though important cannot be discussed here. Clothes of any sort are just a handicap in a jungle climate, where even a single layer of the thinnest material interferes to some extent with the transfer of heat to the air by radiation and convection. The jungle areas of the world are those where the native inhabitants are usually almost naked. In the desert some sort of covering is necessary to avoid sunburn, and material which reflects radiant heat is better than that which absorbs it, but clothes should be thin enough to allow the proper evaporation of sweat. The fact that the sweat is evaporated from the clothes, not the skin, is not of great consequence since the same amount of cooling is produced either way. There are other hazards of the tropical environment: parasitic and infective diseases, for instance, which are not considered here. Protection against these may demand special clothing, mosquito nets and fly-proofing, but it should be recognized that all these measures add to the difficulties of losing heat.

Modification of the body's reaction to heat is only possible within limits which certainly vary between individuals and may differ in different races. Daily exposure to heat, even if only for a few hours a day, quite quickly increases a man's ability to stand up to a hot environment, although this process of acclimatization is not yet completely understood. One important factor is the sensitization of the sweating mechanism: sweating begins earlier and is more copious. Another important factor must be the vasomotor control of the circulation which adjusts itself to the need for an increased skin circulation. Acclimatization, however, also varies with the kind of tropical environment. A man acclimatized to a desert climate is not also fully acclimatized to a jungle climate, although the converse is true. Acclimatization to a desert climate once achieved persists, but clinical observation and experimental evidence agree in supposing that in a jungle climate deterioration sets in at some later period. There is as yet no satisfactory method for deciding in advance whether a particular individual will acclimatize well or badly.

These facts are of especial importance in these days of fast air travel, for the completely unacclimatized individual is likely to fall a rapid victim to heat effects. Fortunately, air conditioning is usually available to modify the environmental rigours. From the broader point of view the effects of air conditioning may not be entirely favourable. It does enable more work of every kind to be done more efficiently, but air conditioning also means that exposure to heat is intermittent. Experience in an American steel mill, however (Collings, Shoudy and Shaffer, 1943), suggested that even one day away from work was enough to reduce the level of acclimatization.

Since in any particular environment the paths by which heat is lost from the body are determined by the physical features of the environment, any increase in the quantity of heat being made by the body must increase the

difficulty of maintaining thermal equilibrium. Muscular exertion always means an increase in the production of heat, and variations in the amount of physical work done may determine whether or not a particular environment produces deleterious effects.

THE DELETERIOUS EFFECTS OF A TROPICAL ENVIRONMENT

In a hot environment the circulation of the skin is greatly increased and in association with this the temperature of the surface of the skin is raised to levels near to that of the body. In a jungle climate this will tend to increase the temperature difference between the skin and its surroundings and hence to increase heat losses by radiation and convection. In a desert climate where the environmental temperature is higher than the body temperature, the increase in skin temperature will decrease the temperature difference between the skin and its surroundings and so reduce the amount of heat added to the body by radiation and convection. In either event the rise in skin temperature will have been of value to the body, and anything interfering with the rise in skin temperature, i.e., with the increase in the circulation of the skin, will be deleterious. Adaptation to any hot environment therefore imposes an additional burden on the vasomotor system. The blood in the skin is no longer available for diversion to other organs in case of need and, as might be expected, fainting is commoner than in temperate climates, as on the barrack square, and in blood donors. There is nothing to distinguish these faints from classical syncope, and the specific term 'heat syncope' is hardly justified. Nevertheless, it is worth retaining to emphasize that there is nothing mysterious about sudden and transient attacks of unconsciousness occurring in a tropical environment, and that these should not be labelled 'sunstroke' as sometimes they have been. The elderly and the arteriosclerotic are less able to stand up to hot environments, partly at least for the reason that their vasomotor control is less efficient than normal.

The sweating mechanism is equally vital to a healthy life in the tropics, but continued sweating sometimes brings ill-effects in its train. Sweat is a weak solution of salt in water. Sweating therefore depletes the body of water and of sodium chloride. Thirst is the natural consequence of shortage of water in the body and is an incentive helping a man to rehydrate himself (an actual shortage of water to drink occurs only in most exceptional circumstances, as after shipwrecks in lifeboats). There is no similar sensation, however, which impels a man to take salt when he is short of it, so that salt deficiency is a common consequence of prolonged sweating, and is responsible for a number of clinical syndromes all cured by the administration of salt. A loss of salt is also produced by vomiting and diarrhœa, and these may be contributory factors. In temperate zones, too, salt deficiency occurs, since whenever men have to work extremely hard physically in a warm environment, as in mines and stokeholds, they sweat abundantly.

The sweating mechanism may also fail altogether. This has been appreciated only relatively recently, and the clinical picture will be described

subsequently. Other ill-effects produced by heat, such as heatstroke and prickly heat, are less well understood, and there are still less defined clinical entities in which it is difficult to be sure how far the causative factors lie in the physical stress produced by a tropical environment, and how far in the psychological stress produced by a foreign environment.

The idea that the direct rays of the sun were especially harmful has now been given up. The sun is a heating agent only, and the effect of shade is to reduce the quantity of radiant heat received by the body. Sunstroke, apparently, does not occur.

HEAT EXHAUSTION

An individual exposed to an environment too hot for him to cope with will have symptoms of heat intolerance. These are numerous and sometimes a little indefinite; an uncomfortable feeling of warmth, headache, an inability to concentrate, irritability, fatigue, dizziness, palpitations and nausea are all complained of, in varying degrees by different individuals. The symptoms are intensified by physical exertion and continued exposure to heat and may be succeeded by collapse, with clouding of consciousness or true syncope. The body temperature may then be raised, but by the time the patient is seen, at rest or in a relatively cool place, the temperature is likely to be normal. This clinical picture is often given the name 'heat exhaustion', but it should be emphasized that heat exhaustion is of itself a nonspecific disorder and an incomplete diagnosis. There are several quite different causes, each with its own specific symptoms and signs added to the general picture of heat intolerance, and each with its own treatment and prognosis.

The cause may merely be lack of acclimatization to a hot environment; the individual has tried to do too much too soon. In a temperate climate it is regarded as natural for an unfit individual who attempts too much to have symptoms of the sort listed above. In a hot environment the symptoms persist for longer, and may seem out of proportion to the physical effort if we fail to appreciate the extra burden the environment puts on the circulatory system. Even fit and acclimatized men faced with abnormally severe exertion may show a similar picture of exhaustion, as they may in a temperate climate too, but it hardly seems appropriate to consider this as something abnormal, and worthy of a clinical pigeonhole. It is nevertheless important to distinguish such cases of inadequate acclimatization and of exercise-produced exhaustion from cases of heat exhaustion with chloride deficiency, for which active treatment is important, and cases of heat exhaustion from a sweating deficiency, in which the prognosis is different.

HEAT EXHAUSTION WITH SALT DEFICIENCY AND DEHYDRATION

As already described, prolonged sweating may lead to salt deficiency. In the body, sodium chloride is almost exclusively extracellular, and forms a solution of constant concentration. Any loss of salt from the body entails the

loss of the appropriate volume of extracellular fluid in which the salt would normally have been dissolved. Thus salt deficiency always entails dehydration as well. To the clinical picture of simple heat exhaustion are therefore added the signs of circulatory failure and of dehydration, a rising pulse and falling blood pressure, sunken eyes and a dry tongue, loss of skin elasticity, and usually oliguria. Anorexia and vomiting are common, and sometimes extreme excitement and hysteria. Sweating continues, however, and the skin is often clammy. A valuable diagnostic aid is the simple bedside test for urinary chloride (Marriott, 1947), which will be well below the normal range.

The cure is salt and water, both together, for one cannot be retained without the other, given by mouth, when salt solution is usually well tolerated, or parenterally if vomiting interferes with intake. An important feature is the *quantity* of salt and water that may be needed to restore the individual to normal. He may be short of a gallon of water and forty grammes of salt and, in addition, he will need a daily allowance of about half these quantities to allow for the normal losses of water and salt in sweat, perspiration, breath and urine.

There was a good deal of propaganda against salt deficiency during the last war and there is now a far more widespread appreciation than there was of its dangers, its cure and its simple prophylaxis by eating enough salt. The syndrome is far more common in desert climates than in jungle climates, as might be expected from the greater volumes of sweat secreted in the former.

Heat cramps occur following muscular exertion in hot environments and usually affect those muscles which have been used the hardest. They are cured within a short time by drinking a solution of sodium chloride in water. Relief within a few minutes is produced by intravenous administration and, although this is probably never necessary therapeutically, the effect demonstrates dramatically that salt deficiency is the cause. Cramps often form part of the clinical picture of heat exhaustion due to salt deficiency.

HEAT EXHAUSTION DUE TO SWEATING DEFICIENCY

It is curious that this syndrome, which must have occurred for centuries, should have been described clearly for the first time in 1944. When it occurs in a jungle climate the clinical picture is unmistakable. Then, besides the symptoms of heat exhaustion there may be polyuria and frequency of micturition, hyperpnœa and a high pulse pressure, but the most striking feature is the contrast of profuse sweating on the face and complete absence of sweating on the body and limbs. There is normally a characteristic appearance of the skin (Horne and Mole, 1950-51), but this is not diagnostic since it is more often seen without symptoms than with.

Immediate treatment is needed only if the body temperature is dangerously high (106° F. [41.4° C.] or over), and then consists in artificial cooling by any available means. Nothing is known that with certainty restores the ability

of the sweat glands to secrete, and the time for natural recovery is anything from a few weeks to several months. Eventually, recovery appears to be complete.

The etiology of the syndrome is unknown. It seems to be an uncommon sequel of severe prickly heat. In fact, a characteristic part of the clinical history is the patient's story that his severe prickly heat suddenly stopped prickling and itching (because sweating ceased), and that as his prickly heat cleared up his exhaustion symptoms began and became intensified.

This description applies to the syndrome in a jungle climate where a complete failure of sweating is compatible with life (if not with health), because the evaporation of sweat contributes relatively little to heat loss. In a desert climate, however, a complete failure of sweating would mean a sudden and continued rise in body temperature until death occurred in a few hours. In a desert climate therefore symptoms occur when the deficiency in sweating is only partial. Recovery also appears to be more rapid, although cases are also more liable to relapse. The characteristic skin change is apparently not seen in hot, dry climates, perhaps because the prickly heat is also much less severe. Diagnosis of the syndrome is therefore much more difficult than in not so hot but humid areas. In both desert and jungle climates the incidence of the syndrome seems to depend upon the minimum temperature, which is what would be expected of a sweating deficiency.

It is unfortunate that there is no simple objective method for assessing the ability to sweat. In a desert climate a sweating skin may feel relatively dry to the touch simply because evaporation is rapid, whereas in a humid climate a skin with only partial recovery of the inability to sweat may nevertheless feel moist because evaporation is so poor. In any event the correct clinical test is not one which measures the volume of sweat produced under some standard set of conditions, but rather the ability of the subject to produce enough sweat to keep him in thermal equilibrium for whatever may be his normal activities. And this is a purely relative matter, depending not only upon the amount and degree of his usual muscular work but also upon how far this particular environment allows heat loss by non-evaporative means.

HEAT STROKE AND HEAT HYPERPYREXIA

Heat hyperpyrexia may be defined as a body temperature over 106° F. (41.1° C.) without an obvious cause, such as an infection or a pontine hæmorrhage. Heat hyperpyrexia with coma is usually called heatstroke. This is a syndrome characteristic of desert climates, usually with a sudden onset, and with a rapidly fatal outcome in the absence of artificial cooling.

The etiology is usually considered to be a breakdown of the thermoregulatory centres in the brain. That the predisposing cause was a peripheral sweating deficiency was proposed by Hearne (1932), but not generally accepted, although few observations on the point seem to have been made. Heatstroke in fit and acclimatized young men is to be expected when the daily maximum temperature has exceeded 110° F. (43.3° C.) for a few days,

but in the elderly and the arteriosclerotic it occurs at much lower environmental temperatures with daily maxima from 90° to 100° F. (32.2° to 37.8° C.).

PRICKLY HEAT

At a distance prickly heat may not seem of much importance, but in jungle climates the discomfort and insomnia it produces can detract quite seriously from a man's efficiency. Its etiology and treatment are still speculative, favourite theories including infection by a fungus, sensitization of the skin by medicated soaps, and mechanical obstruction of the egress of sweat from sweat ducts. Undisputed facts are that it is much commoner and more severe in jungle than in desert climates, that its incidence rises sharply as the minimum air temperature exceeds 75° F. (23.9° C.), and that the symptoms of prickling and itching are provoked by any stimulus to sweating. There is an impression that prickly heat was more severe in the last war than in the previous one, and experimental work (Horne and Mole, 1949), so far unconfirmed, would relate this to the greatly increased consumption of salt following propaganda against the very real dangers of salt deficiency (see p. 578).

TROPICAL NEURASTHENIA AND LOSS OF EFFICIENCY

It is commonly believed that ability for mental as well as physical work deteriorates in hot climates. After sleep is disturbed by sweating or prickly heat, or when the wet forearm sticks to the paper you write on, it is not surprising if performance falls short of the best. Direct measurement shows a correlation between increasing environmental heat and decreasing accuracy in the performance of some skilled jobs (Mackworth, 1950). There is really no reliable information about the long-term effects of exposure to tropical environments, since discrimination between climatic and other factors is so difficult.

Frank mental disorder also is common. Outbreaks of violence occur in many parts of the world in association with hot winds, e.g., the shimal. Riots in Calcutta in 1947 occurred at peaks of environmental temperature. Gross behaviour disorders may occur preceding heatstroke, and in marked chloride deficiency. There is a high incidence of psychoneurotic and psychiatric disorders in troops in hot climates, and also in civil servants from East and West Africa, 'carefully selected Europeans who had chosen a career within the tropics' (Critchley, 1945). The stories of Conrad and Somerset Maugham, to choose only two of the many who might have been named, teem with examples, not all ill enough for invaliding perhaps, but confirming from a wider view the belief that residence in a tropical environment is in some way deleterious to a man's psyche as well as to his soma. The difficulties of assessing in any individual the relative importance of physical and psychical environments in causing his illness are even more formidable than usual.

The word 'accustomization', as an analogue of acclimatization, has been coined (Siple, 1949) to cover the mental and spiritual adjustment to life in a tropical and therefore foreign environment, and failure of accustomization is probably much more common than failure of acclimatization.

Tropical neurasthenia is really an unsatisfactory term, but its very vagueness makes it a useful general heading for a number of so far ill-defined conditions. Chronic fatigue and psychoneurosis without apparent exogenous causes may sometimes be due to salt deficiency, as shown by their improvement when the therapeutic test is applied, but causative factors are probably usually multiple. One feature noticeable in all the literature on this subject is that once again there is a difference between desert and jungle climates. From the latter come the stories, the vernacular names like 'West Coast memory' and 'Bengal head', and perhaps a higher frequency of invaliding. The reason may lie in the monotony of the jungle climate where there is little daily or weekly variation in the environment. Only further observation can show if there is really a climatic factor in accustomization.

TROPICAL ENVIRONMENTS IN TEMPERATE CLIMATES

In a temperate climate no one is continuously exposed to a tropical environment, but many jobs may involve sufficient exposure to a hot environment sometimes to produce deleterious effects. In fact, salt deficiency was first demonstrated in this country in Lancashire miners who had 'heat cramps', and who after treatment with salt supplements realized that they had also suffered from general symptoms, such as undue fatigue. Heatstroke occasionally occurs in steel mills. Acquired anhidrosis is unlikely, but congenitally anhidrotic individuals may find an English summer trying and summer games impossible. Last summer in England while on a training march two cadets died of heatstroke. A summer heat wave will find the English population unacclimatized, and liable, especially after severe exertion, to the effects of 'tropical' heat.

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THE EFFECTS OF EXCESSIVE COLD AND THEIR TREATMENT

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THE types of injury produced by cold include chilblains, immersion foot, trench foot, frostbite and hypothermia. This article will not be concerned with abnormal sensitivity to cold or the effects of cold on subjects already suffering from disease, but will deal with the effects of low temperature on healthy individuals. The work to be described will chiefly be concerned with observations on man rather than animals.

The effects of excessive cold can be divided into local cold injury and the changes produced by general body cooling or hypothermia. The human body as well as those of other animals can tolerate marked falls in body temperature and still survive. The most striking example among mammals is in hibernating animals, whose deep body temperature may fall to 2° to 3° C. (35° to 37° F.) without any apparent ill-effect. The limits in man compatible with survival are much higher, but survival has been demonstrated on many occasions with rectal temperatures as low as 25° C. (77° F.).

HYPOTHERMIA: EXPERIMENTAL AND THERAPEUTIC

Among early experiments on body cooling, mention should be made of James Currie, 1798, who immersed subjects in water at 6.5° C. (44° F.). He measured mouth temperature, which fell slightly and then rose, with violent shivering of the subject. When the subject was removed from the bath there was a further steep fall in mouth temperature, and an even greater fall on placing the victim in a hot bath. These experiments have been repeated in recent years and they confirm in general the observations made over 150 years ago. In order to understand the effects of hypothermia, some aspects of temperature regulation need to be described briefly. The deep body temperature is kept at a remarkably constant temperature in spite of wide variations in heat production and heat loss, but the temperature of the superficial parts of the body may differ considerably from rectal temperature. The gradient of temperature in the tissues can be studied by means of thermocouple needles, and a subject at rest in a thermally neutral environment in which heat balance is maintained will have an average skin temperature of approximately 34° C. (93° F.); the temperature will rise as the thermocouple needle is inserted deeper, to reach a level close to rectal temperature at approximately 2 cm. depth. This implies that even in a state of thermal equilibrium a shell of approximately 2 cm. thick is at a lower temperature than that of the deep core, and such a shell represents nearly 50 per cent. of the total body mass. In a cold environment, particularly in cold

water, the surface temperature drops and the gradient extends deeper into the body. The stored heat of the body has therefore been reduced although deep body temperature may still be maintained without marked change.

Behnke (1950) has recently carried out experiments on himself and other volunteers, immersing himself in ice water for as long as an hour. Surface temperature fell rapidly and within a few minutes was close to that of the water. The loss of heat from the body was, of course, very great. Nevertheless, the rectal temperature rose slightly after the start of the experiment, and there was no fall until after some thirty minutes of immersion; thereafter there was a gradual decline, but at the end of the experiment rectal temperature had fallen by not more than 1.5° C. (2.7° F.).

The first point to emphasize therefore is that great heat loss can occur before there is a significant fall in rectal temperature. The explanation is that heat loss from the deep core is diminished by an immediate cutaneous vasoconstriction, and a vasoconstriction which includes all the vessels of the limbs and probably the vasculature of the trunk muscles. Heat flow from the deep core to the surface is temporarily reduced, although, of course, the stored heat in the superficial layers diminishes. Immediate and intense vasoconstriction causes a greatly increased gradient in the deep core to the surface, with reduced heat flow, and hence a rise in the temperature of the core. Heat production is also greatly increased, mainly by shivering, which can raise the metabolic rate up to seven times basal level. If the increased heat production due to shivering cannot balance the total heat loss, the temperature of the deep core will begin to fall. The fall in rectal temperature which occurs when the subject gets out of the ice water is due to the rise in temperature of the surface of the body. Blood flow is re-established through these intensely chilled superficial areas, so the temperature of the venous blood draining the cold skin is greatly reduced; hence the marked initial fall in rectal temperature. If the subject is placed in a warm bath the vasodilatation in the skin and superficial tissues is both more rapid and more marked, with a greater blood flow through these tissues, so that even in a warm bath of the order of 37° C. (98.6° F.) there will be a fall in rectal temperature, although of shorter duration. The thermal conductivity of human skin, fat and muscle is low, and the thermal lags in such tissues are considerable unless there is a large blood flow through them. The initial effect of the large blood flow is to raise the temperature in these tissues and to cool the blood flowing through them. If sufficient heat is supplied in the surrounding water this, combined with the increased blood flow, will soon raise the temperature of the superficial tissues, and therefore the rectal temperature will begin to rise once more. The effects of such acute and intense chilling are not serious, and the falls in deep body temperature for short-term exposure in very cold water are not sufficient to cause damage. With more marked falls in deep body temperature, however, there are profound alterations in the circulatory system, control of respiration, and acid-base equilibrium. There is much information available regarding the changes in hypothermia because of the clinical uses of body cooling in the treatment of neoplasms, and also in schizophrenics.

Before the war, Smith and Fay (1940) treated a number of cases of inoperable carcinoma by prolonged hypothermia. Body temperature was reduced either by surrounding the patient with rubber bags containing packed ice, or by a blanket with rubber tubing wound round the outside through which a refrigerant fluid could be circulated. The patients were sedated and anæsthesia was maintained during the initial stages of refrigeration. This was found to be necessary, as otherwise the violent shivering greatly delayed the fall in body temperature. In the anæsthetized patient, body temperature fell steadily down to 25.5° to 28° C. (78° to 82° F.) and could be maintained at that level for periods of up to forty-eight hours. Similar techniques were used in the treatment of cases of schizophrenia, and detailed observations were made by Talbott (1941), and Dill and Forbes (1941). Blood pressures fell during hypothermia, showing a direct relationship with rectal temperature. There was a steady reduction in the blood volume owing to prolonged cooling, and plasma loss with increasing hæmoconcentration.

HYPOTHERMIA AND THE HEART RATE

The most striking circulatory change in hypothermia is the steady decrease in heart rate: at rectal temperatures of 30° to 31° C. (86° to 88° F.) heart rates below 30 per minute are usual. The bradycardia is not affected by atropine, and in animals is not abolished by vagotomy (Hegnauer *et al.*, 1950). It is due to direct cooling of the pace-maker of the heart. Arrhythmias are common at rectal temperatures of 30° C. (86° F.) or lower. Auricular fibrillation has often been observed in hypothermic dogs, and was also seen in several of Smith and Fay's patients. The decline in heart rate is almost linear with rectal temperature.

Further evidence of the mode of death in hypothermia in man was obtained by the German S.S. Doctor Rascher in his experiments on the prisoners at Dachau. Details of these terrible experiments were obtained by Major Alexander (1945), of the U.S. Army, who has published a full account of them. Prisoners were immersed in water at temperatures of from 2° to 12° C. (35° to 53° F.). It was found that death occurred at rectal temperatures of 25° to 27° C. (77° to 87° F.). Auricular fibrillation was commonly observed at rectal temperatures below 30° C. (86° F.), and the mode of death appeared usually to be due to ventricular fibrillation. Animal experiments on dogs substantiate these findings that in hypothermia death is due essentially to the changes in the conducting system and ventricular fibrillation of the heart. Cardiac output measured in dogs decreases steadily with fall in rectal temperature, and at rectal temperature of 25° C. (77° F.) or lower is from 16 to 20 per cent. of control values (Bigelow *et al.*, 1950).

Initially with cooling, as pointed out above, there is intense shivering with consequent marked increase in oxygen consumption, but as the body begins to cool below a rectal temperature of 34° C. (93° F.) the intense shivering diminishes and oxygen consumption falls. By the time a rectal temperature of 31° to 32° C. (88° to 90° F.) is reached, apart from occasional bouts of shivering, the subject is usually quiescent and consciousness is clouded. Shivering is succeeded by an intense muscular rigidity, and oxygen consumption falls steadily with a decreasing rate of respiration. In animals with a rectal temperature of 20° C. (68° F.) the oxygen consumption may have

fallen to one-fifth of that at normal body temperature, and at these low levels of oxygen consumption the volume of oxygen dissolved in the blood may almost prove adequate for the oxygen demands of the tissue, so that there is virtually no dissociation of oxyhæmoglobin. The carriage of CO_2 is therefore considerably affected and there are marked changes in the acid base equilibrium.

In summary, the effects of hypothermia after the initial stimulant effect of cold on metabolism include a steady decline in heart rate, cardiac output and blood pressure, together with a fall in oxygen consumption. The fall in heart rate is essentially due to the effect of temperature on the pace-maker; cardiac arrhythmias, including auricular fibrillation and heart block, follow, and finally, ventricular fibrillation, which is probably the main cause of death, may supervene. When hypothermia is prolonged, there is a significant change in blood volume, due to a diminished plasma volume and increasing hæmoconcentration. There is, of course, an intense peripheral vasoconstriction and a high peripheral resistance.

TREATMENT OF HYPOTHERMIA

The treatment of acute hypothermia was a serious problem in the 1939-45 war, for survivors in planes and ships might be in a cold sea for hours or even days. Many such survivors died shortly after rescue, and many different treatments were tried by the British, Americans and Germans. No stimulant drugs were found to be of any value. It was thought that oxygen was of some use, but there is no satisfactory evidence to support this. The Dachau experiments were primarily devoted to methods of resuscitation, and following a series of animal experiments by several groups of German physiologists, rapid re-warming in very hot water 45° to 50° C. (113° to 122° F.) was employed and found to be the most effective treatment. The death of survivors mentioned above shortly after rescue was in part due to the fall in rectal temperature which occurred with gradual re-warming and which may have precipitated ventricular fibrillation. The most effective treatment so far discovered is rapid re-warming. The re-warming must be rapid in order to counteract the initial fall in rectal temperature, and water even as hot as 50° C. (122° F.) may not, so far as one can tell from the Dachau experiments, be dangerous. If, however, hypothermia has developed more gradually and has been more prolonged, as may occur with exposure in cold air, then it is possible that rapid re-warming may be dangerous. The decrease in total blood volume which occurs with prolonged hypothermia means that during rapid re-warming, with the consequent increased circulation through the skin and superficial tissues, the available blood volume is inadequate. There is a marked fall in peripheral resistance, and blood pressure may collapse. The treatment of prolonged hypothermia would alternatively be a very gradual re-warming, and this was employed in the treatment of the negress found last winter in the streets of Chicago with a rectal temperature of 18° C. (64° F.) (Laufman, 1951). She was left to re-warm by her own

metabolic activity at a room temperature of approximately 21° C. (70° F.), and her rectal temperature rose at the rate of 1° C. (1.8° F.) per hour. The most dangerous form of treatment in either acute or chronic hypothermia is moderate re-warming, which increases the circulation in the superficial tissues without supplying adequate heat to the body. In chronic hypothermia it may be possible to combine rapid re-warming with transfusion.

LOCAL COLD INJURY

Immersion foot and *trench foot* are probably examples of the same phenomenon. If the extremities are maintained in a cold, damp atmosphere or in cold water, injury may result after some hours. Immersion foot has been clearly described by Ungley (1949), who observed many cases among shipwrecked survivors. Such survivors might have spent periods of hours or days in an open boat or raft, often up to their knees in cold water, at temperatures between 5° C. (41° F.) and 18° C. (64° F.). After the first sensation of cold passes off, the feet feel numb. On rescue, survivors were either unable to walk or walked with difficulty, complaining that it felt as if they were walking on cotton-wool. The feet when examined shortly after rescue were white and cold with occasional cyanotic patches. There was usually considerable œdema and loss of sensation of varying degree. Within a few hours of rescue the feet became hot, red and swollen, and the patients complained of an intense burning sensation in the feet. Subsequently, depending upon the severity of the case, the feet would become blistered, with patches of gangrene, the extent of which varied considerably. Recovery was always extremely slow even in cases without actual tissue loss. Loss of sensation and paræsthesia persisted for weeks and sometimes months. Atrophy of the small muscles in the foot was common, occasionally with almost complete paralysis. During the recovery phase anhidrosis was almost invariable and increased sensitivity to cold might persist, even in mild cases, for months and sometimes years. For a full clinical description and the pathological changes the account by Ungley should be consulted.

Among the changes observed by Blackwood (1944) was a peripheral nerve degeneration and muscular atrophy. For this reason, Ungley described the condition as peripheral vasoneuropathy after chilling. Such changes are also observed in soldiers who have for prolonged periods been standing in cold, muddy trenches. The limits of tolerance of chilling remain to be worked out in detail. It is clear, however, that although immersion foot and trench foot are essentially examples of local cold injury they are invariably associated with a degree of body chilling. Local cold, such as immersion of the hand in ice water with the rest of the body maintained in a warm environment, does not rapidly result in cold injury. The hand may be maintained in ice water for periods of up to three hours without any apparent injury, if the subject is warm. In fact, as Lewis (1930) first showed, there is a marked vasodilatation in the cold, and the rate of blood flow in the hand immersed in ice water is very large. This increased circulation serves as a protective

mechanism in that the temperature of the deeper tissues in the fingers and hand does not fall, or falls only a few degrees. Greenfield and his colleagues (1950 a,b) have recently studied this phenomenon in great detail and they have shown that the local vasodilatation to cold is markedly affected by the degree of warmth of the body as a whole. If the subject is cooled, then the vasodilatation observed in the hand in ice water is greatly reduced. Local cooling by itself therefore is not likely to cause injury unless the whole subject is also losing heat. Circulation through the extremities is affected both by local temperature conditions and by general body temperature.

If cold vasodilatation is suppressed by general body cooling, then the temperature of the whole of the immersed part will fall rapidly to that of the surrounding water. This certainly can occur in the forearm immersed in water at temperatures higher than those required to produce cold vasodilatation, i.e. water at 15° C. (59° F.). The temperature of even the deepest part of the forearm will fall to within 2° C. (3.6° F.) of the surrounding water in the course of two to three hours. At such temperatures the blood flow is extremely low and there may be periods of almost complete ischæmia. Ungley has pointed out that in immersion foot there must be some blood flow during cooling, at any rate for part of the time, as otherwise there would not be œdema of the part when first observed. So far as can be said at present, the main effect of prolonged low temperature would appear to be on the small vessels, muscle fibres and nerve fibres. On re-warming these chilled parts there is an extreme vasodilatation with a rapid blood flow, and there appears to be an increased permeability of the capillaries, hence a rapid formation of œdema. Subsequently the blood flow slows and some areas appear to become completely ischæmic. There is considerable debate as to the effect of cold on blood vessels and why the blood flow should cease in certain areas. In part this may be due to such marked plasma loss, owing to the increased permeability, that the red cells only are left within the vessel and therefore the vessel is in effect blocked by a red-cell plug. This problem is similar to the changes occurring in frostbite.

The *treatment* of trench foot consists essentially of protection against further injury and prevention of sepsis. Occasionally sympathectomy may be required to relieve a persistent hyperhidrosis. There is no specific mode of treatment at present and it is not possible to be dogmatic about immediate first-aid measures. Rapid re-warming by immersion in hot water has not been sufficiently examined for one to be able to state whether it is beneficial, but the bulk of evidence appears to be against rapid re-warming. Moderate re-warming is almost certainly unsatisfactory, and therefore slow re-warming is probably the safest course, with a patient in effect thawing himself out. It is, of course, a glimpse of the obvious to emphasize that the best mode of treatment of trench foot and immersion foot is prevention. With increased experience it is now realized by medical officers in the Forces that the incidence of trench foot is directly related to the lack of morale, or, more precisely, discipline in the unit concerned. Careful foot inspection at

regular intervals, changing of socks, so that tight socks are not worn for long periods, careful drying of the feet, and the avoidance of tight boots, are undoubtedly some of the main factors for the decreasing incidence of trench foot, even under active Service conditions.

Chilblains represent the mildest form of cold injury. Recurrent exposure to wet-cold, followed by rapid rewarming, appears to be the main exciting cause. Chilblains are common in this country; approximately 50 per cent. of the population have suffered at some time. They are rare in North America, although winters are longer and colder than in Britain. Chilblains and frozen pipes are part of the price paid for the inadequate design of houses and factories. Our winters are usually relatively short and mild, so the heating and insulation which are essential in countries with cold winters, are considered unnecessary and even undesirable. Low indoor temperatures are common, especially at floor level and recurrent cooling of the feet, particularly on standing, may be sufficient to cause damage (Bedford, 1948).

Lewis (1941) and many others have characterized chilblains as a vascular disease, with capillary and venous dilatation combined with arteriolar spasm. It has been pointed out that there is a close similarity between chilblains and mild forms of trench foot. It may be considered that chilblains represent a less serious version of the vascular reaction observed after thawing of frostbite or trench foot.

Treatment, which is unsatisfactory, is reviewed by Dowling (1948). Those who are susceptible to chilblains should be advised to keep their extremities warm, to heat their houses, and to avoid prolonged standing without exercise. More work on this common ailment is obviously required.

FROSTBITE

The first paradox of frostbite is that it is a rare condition in the civilian population of cold countries, as the technique of life in the cold climate is understood: how to escape cold injury and how to deal with it if it does occur. Frostbite is encountered in large numbers only in war time, when it may not be possible to take the precautions necessary and when the techniques required are not always fully understood. At first sight the pathology of frostbite appears to be a relatively simple problem. The temperature of the tissue falls, the freezing point is reached, ice crystals form, and either the formation of ice crystals or thawing can cause mechanical injury of the tissues concerned. In particular, there may be hæmolysis of red cells and formation of red-cell thrombi. Briefly this may be said to summarize the views held at the beginning of the war (Kreyberg, 1949).

There are many objections to this account. There is abundant evidence that individual cells can withstand prolonged freezing at very low temperatures. Recently, for example, Smith (1950) has shown that red cells in glycerol solution can survive freezing up to −79° C. for periods of weeks with only slight hæmolysis, and that such red cells, after thawing and removal from glycerol, can be successfully transfused (Mollison and

Sloviter, 1951). They have also found that ovarian tissue of considerable size in comparison with red cells, i.e., of the order of 1 to 2 c.mm., can also survive prolonged periods as low as −79° C. They can thereafter be transplanted and the transplantations will live, with subsequent development of ova. So actual freezing presumably with crystal formation is not incompatible with living cells. On the other hand, as is pointed out above, injury can follow prolonged cooling to temperatures which are above freezing point of living tissue. It is still not certain whether so-called frostbite is invariably accompanied by crystal formation, i.e. ice in the tissues concerned. It is difficult to explain the damage in frostbite as due to mechanical injury, as there is a very important time factor. The ethyl chloride spray, which certainly lowers skin temperature below freezing point, is probably accompanied by actual ice formation in the skin. But the short period of cooling does not appear to cause injury.

Similarly, in cold countries it is not unusual to observe frostbite on the cheeks, ears and the tip of the nose. Such frostbite is usually not detected by the victim, but will be noticed by a companion, who will see a yellow-white area standing out in sharp contrast to the surrounding pink or red skin. This area feels cold and hard to the touch. It can easily and readily be thawed out, and provided such thawing out is done within some ten to twenty minutes of the frostbite, no permanent injury results. If crystal formation has occurred in these various conditions, which is not yet proved, then certainly a short period of actual freezing does not prove harmful. As pointed out by Lewis (1941), the freezing point of skin is approximately −2.2° C. (28° F.), but super-cooling is usual, so that the temperature of the skin may have to be lowered to −10° C. (14° F.) or even lower before crystal formation occurs. Frostbite with crystal formation will not be seen until the temperature of the parts concerned has fallen to these low temperatures.

The changes which are observed in cases of frostbite are not greatly dissimilar to those seen in trench foot and immersion foot. Before thawing, the part is usually white; after thawing the blood vessels dilate and there is a very high rate of blood flow. In this hyperæmic stage the permeability of the blood vessels is so greatly increased that there is a rapid development of gross œdema. Since plasma leaks so fast from the vessels, a marked local hæmoconcentration develops, with complete or partial stasis owing to blocking of the vessels by red cells. The frostbitten part will at this stage be extremely swollen and blistered, and the blood flow is reduced or may be completely suppressed in severe cases, in which case gangrene follows.

There has been a considerable volume of experimental work on frostbite in small animals and some reference must be made to such work, although, of course, caution has to be exercised in applying the results obtained in small laboratory animals to man. Animals, including guinea-pigs, rats and rabbits, in such experiments are given short but severe cold exposure, by dipping the foot or leg into a freezing mixture at a temperature of −15° to −30 C. (5° to −22° F.) for periods of two minutes up to half-an-hour. The

changes that occur are undoubtedly similar to frostbite in man. There is, however, some controversy as to the main sites of damage by cold, even in animals. Many workers, including Crismon (1944, 1948), Kreyberg (1949), and Shumacher (1947) consider that frostbite is essentially an example of vascular damage. On the other hand, others, including R. B. Lewis (1951), have produced evidence to show that cold damages or kills tissue directly, and that the vascular changes are only one of many changes due to cold. Lewis, for example, considers that the susceptibility to cold is particularly marked in muscle and nerve; less so in skin. His histological studies indicate that blood vessel damage is not the earliest change to be found.

The *treatment* of frostbite will therefore depend upon the view that is taken of the pathology, and treatment is still a matter of controversy. If it is correct that exposure to low temperatures produces direct damage to all the tissues of the part concerned, then rapid re-warming can have only a limited effect. On the other hand, if the vascular changes are primary and no great injury has been produced by the cold direct on the tissues, then treatment should be directed to preventing the violence of the vascular reaction and to the consequences of such violent dilatation; in particular it should be an object of treatment to prevent the blocking of vessels. If the many papers on the treatment of frostbite are consulted, it will be seen that a wide variety of treatments is advocated. These range from rapid re-warming by immersing the frostbitten part in hot water, on the one hand; on the other, maintenance of the part at low temperatures with extremely slow and gradual thawing (Greene, 1941). The German workers include those who insist that thawing must be very carefully carried out, proceeding from the centre out to the periphery, almost mm. by mm. (Killian, 1949). Animal work suggests that rapid re-warming undoubtedly reduces tissue loss (Pichotka and Lewis, 1949). These experiments have, however, been carried out on small animals with small bulk of tissue, so that immersion in hot water will rapidly raise the temperature throughout the part concerned. In the case of man the bulk of tissue concerned is far greater and, owing to the low thermal conductivity of human tissues, immersion even in hot water will only slowly raise temperature of the deeper parts. So that, in effect, rapid re-warming is extremely difficult in man.

As the circulatory changes are the most important in frostbite, measures to reduce the formation of thrombi should be of value. Lange and his colleagues (1947) have therefore advocated the use of heparin in the treatment of frostbite. The evidence, however, of the value of heparin is equivocal. Animal work does not support its use, and the few reported trials in man are not thoroughly convincing (Pichotka and Lewis, 1949). Heparin is being widely used in the treatment of frostbite casualties in Korea, and it may be hoped that definite evidence for or against its value will soon be forthcoming. ACTH and cortisone are also being tried in frostbite. The limited evidence available so far does not suggest that their use is of great value. Pressure casts have also been advocated on the grounds that the œdema following

thawing is a serious factor in the subsequent course of frostbite injury. The œdema fluid has a high fibrinogen content which is presumably responsible for the widespread fibrosis in the later stages of frostbite. Pressure casts were examined by Crismon and his colleagues (1948) in the treatment of experimental frostbite in animals. The benefit was small but significant.

The treatment of frostbite can therefore best be summarized by saying that there is at present no special treatment of proved value. It is important to prevent further injury to the frostbitten part. It is dangerous to attempt so-called restoration of the circulation by rubbing with snow; the part should be lightly bandaged until hospital treatment can be given. The prevention of sepsis is probably the most important active measure to be undertaken. Thereafter the treatment must continue unless gangrene supervenes. No mention has been made of nerve block or sympathectomy, or of the many means which might be employed to increase the circulation through the extremities after the first violent vasodilatation has diminished. The evidence in favour of these methods is still inadequate (Shumacher, 1947). Our understanding of this problem is still extremely insufficient, and it is unlikely that treatment will progress beyond purely conservative measures until we know much more than at present of the detailed changes that occur with low temperature.

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THE IDEAL HOME

OPTIMUM LIVING CONDITIONS IN TEMPERATE CLIMATES

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PROBLEMS which arise or become acute during the emergency of war demand and receive energetic cooperative attention by all who can contribute to their effective and expeditious solution. It is well known that such circumstances have led to rapid and outstanding achievements in certain branches of clinical medicine and surgery, but the substantial advances made in housing science and practice in the domain of public health, hygiene or preventive medicine need to be more widely known, for they are calculated to be of permanent benefit to the physical, mental and social health of the population as a whole.

Air, warmth and light are some of the essential physiological requirements for health and comfort in the home, and common experience teaches that climate determines the nature and extent of the means necessary for their provision. The present article is concerned with the indoor climate of houses designed to enable man to live and enjoy a full life in temperate climates in spite of seasonal variations and the vagaries of the weather from day to day.

The terms 'cool' and 'equable' have been used to describe a temperate climate, and it is of interest to note that both are referable to man's thermal sensations. Air temperature and wind in winter are the main elements of climate to which indoor conditions need to be adjusted in Great Britain. Other factors such as solar radiation and humidity need consideration, but they are obviously of less importance than in the tropics.

In recent years the urgent demand for rehousing vast sections of the population in this and other countries has drawn attention to the fact that such vague expressions as 'suitable', 'sufficient' or 'adequate' when applied to ventilation, heating and lighting must be defined qualitatively and quantitatively in terms which architects, builders and engineers can use in practice, and which authorities responsible for housing can, with confidence, accept as standards of good practice calculated to meet human requirements for health and comfort, and to permit the efficient performance of the many fatiguing domestic tasks which form such an essential part of family life.

In 1942, through cooperation between the Ministry of Health, the Ministry of Works, the Department of Scientific and Industrial Research, and many professional institutions, several special committees were formed to review existing scientific knowledge and to make recommendations for practice in post-war building. A number of valuable reports under the

general title of 'Post-War Building Studies' (1944-47), published by His Majesty's Stationery Office, were produced. In September, 1942, the Council for Codes of Practice for Buildings was established, and as a result of its activities the British Standards Institution has been able to issue a series of British Standard Codes of Practice which define the functional requirements of buildings and clearly indicate standards of good practice in housing. These Codes do, in fact, summarize the findings of research and proved experience which must be applied in housing if human requirements are to be satisfied. They also allow for the subsequent incorporation into them of knowledge which may result from research on problems which still await solution.

The principles and standards of good housing practice defined in these and other official publications were adopted by the Ministry of Health for local authority housing several years ago. In this connexion, attention should be drawn to the Housing Manual of 1949, and the 1951 and 1952 supplements to it issued by the new Ministry of Local Government and Planning, in which special reference is made to the increasingly important problem of housing for old people, and the needs of single workers, disabled persons, district nurses, midwives, clergymen, doctors and others who require additional rooms for professional purposes. It is abundantly clear that no single prescription for an ideal home is conceivable in view of the diversity of needs, quite apart from diversity in taste. However, within certain limits determined by variation between individuals, physiological requirements are very similar, and this justifies the definition of a range of indoor climatic conditions within which optimum levels for the health and comfort of a particular individual or family may be found.

Although it would be quite outside the scope of this article to deal with special cases, it is necessary that the fundamental truths justifying the qualitative and quantitative definition of desirable standards for indoor climate should be clearly stated and understood. Such knowledge gives courage of conviction to those whose duty it is to insist that housing design, construction and equipment shall permit the ready attainment of desirable conditions by the occupants. It is essential, moreover, that householders themselves should realize and believe that family health and comfort in winter and summer will be adversely affected if they neglect to control indoor climate or make improper use of the amenities provided in modern houses for that express purpose.

FUNDAMENTAL CONSIDERATIONS

A fundamental truth which helps to solve many human problems because its light reveals their nature is that enunciated by Claude Bernard in 1878, which has been interpreted by Cannon (1929) to mean that man's capacity for a 'free and independent life' depends upon the ability of the physiological mechanisms of the body concerned with respiration, circulation, and

body temperature regulation to maintain and control certain physical and chemical characteristics of the blood and tissue fluids at levels required by the specialized cells of the tissues and organs for normal functioning. This conception needs to be borne in mind when considering the significance to health and comfort of many physical factors in the external environment —in the present instance the indoor environment of the home—which can exert a beneficial or harmful influence on physiological processes.

As in the case of certain diseases, actual structural damage to, or the functional impairment of, physiological mechanisms affects the body as a whole, so in ordinary health, excessive local or general physiological stress imposed on us by external conditions lowers our sense of well-being and capacity for performance.

It would be out of place to deal with psychological factors in the home environment which affect health and comfort, except perhaps to observe that the extent of their influence for good or ill may, in part, be determined by the indoor physical climate.

VENTILATION AND HEATING STANDARDS

The respiratory needs of the average adult sitting resting would be amply met by breathing approximately 15 cubic feet of fresh air per hour. Quantitatively this figure is so small in comparison with the minimum fresh air ventilation standard of 600 cubic feet per person per hour recommended for ordinary living rooms that the reasons for the difference merit examination.

The ingenious experiments of the late Sir Leonard Hill (1913), carried out at the London Hospital some forty years ago conclusively proved that in ordinary rooms the need for ventilation is not determined by decrease in oxygen concentration or the progressive accumulation of exhaled carbon dioxide in the air, the control of which had been the basis of ventilation standards formerly adopted by authorities. Hill's experiments showed that ventilation and air movement were major factors influencing thermal comfort and the mechanisms concerned with the maintenance of normal body temperature. The temperature of the air and its humidity also play an important part, for together with air movement they determine the rate of heat loss which the body can achieve by making use of the physical processes of convection and evaporation. Incidentally, the evaporation of one gramme of moisture from the lungs or skin involves the absorption of rather more than half a kilocalorie of heat.

It is common experience that a crowded room rapidly becomes uncomfortably warm owing to the heat imparted to the air by the occupants, and accurate measurement by scientific research has yielded data for the amount of body heat produced per hour by individuals varying in age, height, weight, and degree of activity. With the development of air conditioning, the heating and ventilating engineer has found it essential to allow for the

large amount of heat and also moisture given off, for example, by the audience in a cinema, when calculating the capacity of the plant required to keep the temperature and humidity of the air from becoming uncomfortably high. The figure used as a basis for his calculations is 400 B.T.U.s* per hour, which is equivalent to 100 kilocalories and is, in fact, the excess heat which the average adult sitting resting generates in the body by the metabolic processes which provide energy for such essential functions as respiratory movements, the muscular contractions of the heart, and many other internal activities which proceed continuously but unnoticed. It is not, however, generally realized that if the human body were completely prevented from giving up this surplus heat to its external environment, particularly to the air, the temperature of an average adult would rise at least 3° F. in one hour to well over 101° F. (38.3° C.) and mount with increasing rapidity, owing to the fact that a rise in temperature speeds up chemical and physical reactions, with consequent increase in the rate of heat production. This is a rather lengthy statement of fact, but it is given for two reasons. The first is to make it clear that it is not a matter of personal opinion but a scientifically proved fact that the ventilation of a room is a requirement for health and thermal comfort. Secondly, that the heating of a room in winter is not designed to add heat to our bodies, for they produce excess heat, but to ensure sensations of thermal comfort which subconsciously indicate that we are not losing heat more rapidly than we produce it or more rapidly than it is conveyed to the extremities, the hands and feet, by the circulating blood. It is common experience that we make use of clothing for the same purpose, and the lighter weight indoor clothing worn by residents in the United States accounts for the fact that they need a higher indoor temperature than the standards of warmth acceptable in Great Britain.

It has been estimated that a comfortably clothed individual sitting in an ordinary room in which the surface temperature of the solid surroundings and of the air is 60° F. (15.5° C.) and the relative humidity 50 per cent., loses his surplus body heat to the environment in approximately the following proportions:—

45 per cent. to the solid surroundings by radiation.

55 per cent. to the air by convection and the evaporation of moisture from the lungs and insensible perspiration from the skin.

Experience teaches that we are very sensitive to increased heat loss by radiation if the walls of a room are cold, or if we sit with our backs to an uncurtained window in winter time. In summer, the absorption of solar heat by the roof and its transmission to the ceiling in a top-floor room

* 1 B.T.U. is the amount of heat required to raise the temperature of 1 lb. of water 1° F.

1 kilocalorie is the amount of heat required to raise the temperature of 1 kilogramme of water 1° C.

results in thermal discomfort at night, due to the fact that radiant heat from the ceiling surface markedly reduces loss from our bodies in that direction. Opening windows to increase air movement and ventilation and consequent heat loss by convection helps to restore comfort, but it is better practice to instal some form of thermal insulation between the roof and ceiling, as this will serve the dual purpose of preventing undue heating in summer or chilling in winter.

The thermal insulation of walls, by methods which are fully described in the publications referred to, promotes the attainment of warmth in winter and enables great economy in fuel to be effected. If the walls of a room are panelled with wall board of low thermal capacity, the surface temperature rises rapidly if there is any source of radiant heat. Some years ago Dufton (1931) showed that such measures enabled a greater degree of warmth to be attained in half an hour than had been possible in an hour and a quarter with bare masonry walls. Many detailed studies on heating and ventilation have been carried out by J. C. Weston (1949) and J. B. Dick (1949), of the Building Research Station, in a number of modern houses on an estate at Abbots Langley. Information of great practical value has been obtained concerning the effects of wind on ventilation and other factors which must be taken into account if the optimum use is to be made of fuel for heating purposes.

Apart from the need for ventilation and heating to be easily controllable by the occupants of a house, it is most necessary that the heating installation should be capable of maintaining indoor warmth during the coldest period of the year. In this connexion it is of interest to note that when the mean outdoor temperature falls to 60° F. (15.5° C.) in autumn, people begin to make use of heating appliances for warming their homes. One of the factors determining the amount of heat required to maintain a definite level of warmth is the difference between the indoor and outdoor air temperatures. The maximum heating capacity of the installation required for a house of given construction is usually calculated on the basis of an indoor temperature of 65° F. (18.3° C.) and an outdoor temperature of 30° F. (—1.1° C.), due allowance being made for the heat loss occurring when the rate of air change conforms to the standards of ventilation recommended for health and comfort.

The minimum standards for ventilation given in table 1, and the ranges of temperature shown in table 2, apply to indoor conditions in winter time. In regard to ventilation in living rooms, it will be noted that the fresh air supply per person is related to the cubic space available, the actual figures given being the minimum amount per hour necessary to prevent the build-up of body odour. It has been shown that these rates of air supply are compatible with thermal comfort, provided the air movement in the room varies from 20 to 40 feet per minute at head level. A greater air velocity than this is likely to cause unpleasant draughts when the air temperature is

about 60° F. (15.5° C.), but in summer air velocities up to 100 ft./min. may be necessary for comfort. It should also be noted that the air temperatures at foot level should not be more than 5° F. (2.8° C.) lower than that at head level.

TABLE 1

VENTILATION IN HOUSES AND FLATS	
Room	Minimum rates of Fresh Air Supply
Living rooms and bedrooms:	
Cubic space per person: 300 cu. ft.	720 cu. ft. per hour per person
" " " " 400 cu. ft.	600 " " " " " "
" " " " 500 cu. ft.	420 " " " " " "
Kitchens:	2,000 cu. ft. per hour
Pantries or larders:	2 air changes per hour
Halls and passages:	1 " " " "
Bathrooms and lavatories:	2 " " " "

TABLE 2

STANDARDS OF WARMTH IN HOUSES			
Room	Air temperatures at 5 ft. level	Relative humidity	Equivalent* temperature
Living rooms	60° F.–68° F. (15.5° C.–20° C.)	30–65 per cent.	62° F.–66° F. (16.6° C.–18.9° C.)
Bedrooms	55° F.–57° F. (12.8° C.–13.9° C.)	30–65 per cent.	50° F.–55° F. (10° C.–12.8° C.)
Kitchen	60° F. (15.5° C.)	less than 70 per cent.	60° F. (15.5° C.)
Halls and passages	45° F.–50° F. (7.2° C.–10° C.)	30–65 per cent.	50° F.–55° F. (10° C.–12.8° C.)
Bathrooms	55° F.–57° F. (12.8° C.–13.9° C.)	—	—
Lavatories	55° F.–57° F. (12.8° C.–13.9° C.)		

British Standards Code of Practice

Note: (i) In order to prevent condensation on walls and furnishings, the temperature in the whole house should not be less than 45° F.–50° F. (7.2° C.–10° C.) even at night.

(ii) In cases of illness, the bedroom should be warmed to about 65° F. (18.3° C.).

(iii) If the living rooms are heated by radiation from a high temperature source, the comfort range for air temperature is lower, e.g., from 58° F.–62° F. (14.4° C.–16.6° C.), and the mean surface temperature of the surroundings should be within these limits.

(iv) *Equivalent temperature takes into account air temperature, air movement and radiant heat from the surroundings.

Measurements.—For details concerning the instruments used in assessing indoor climate, readers are referred to M.R.C. War Memorandum No. 17, 1946: 'Environmental Warmth and its Measurement', by T. Bedford; and to the *Journal of Hygiene*, March 1949, **47**, No. 1, 'The Measurement of Domestic Ventilation', by E. T. Renbourn, T. C. Angus, J. McK. Ellison, L. M. Croton and M. S. Jones.

The photographs in figures 1, 2 and 3 were taken during the course of experimental studies on housing requirements for health and comfort carried out for the Ministry of Works and the Building Research Station of the Department of Scientific and Industrial Research. One series of experiments showed that whether the living room is 8 ft. or 7 ft. 6 in. in height, conditions conforming to present-day standards for health and comfort could readily be maintained in summer and winter provided the occupants made appropriate use of windows and fires of the type installed

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FIG. 1.—Apparatus used for assessing indoor climate. The black cylinder on the left is the eupatheoscope used for the measurement of equivalent temperatures; the radiometer in front of the fire measures radiant heat, and the silvered thermometer, globe thermometer and kata thermometer on the stand enable the air temperature, mean temperature of the surroundings, and air movement in the room to be assessed. The grating above the fire enables warmed air to be discharged into the room or transmitted by ducts in the wall to the bedroom above.

in modern houses. This finding was confirmed by a field investigation in which the opinions of families occupying houses with rooms 7 ft. 6 in. in height were collected from estates in various parts of England and Wales. A photograph of one of these houses in Sussex is shown in figure 4.

In order to bring home the importance of not disregarding the standards recommended for health and comfort, and the disturbing sequelæ which may result from failure to make use of ventilating and heating provisions, it is worth while placing on record the case of two ladies who had a well-furnished and admirably constructed house, but claimed that they were driven to sleeping elsewhere at night and using it to a minimum extent during the day as they felt it to be uninhabitable. The

house, near London, was visited and the first impression on entry was that it felt cold and fusty and that the indoor climate was dank and stagnant. Measurements of air temperature in the living rooms showed that it was from 3 to 5° F. below the lower limit of the comfort zone. The fresh air ventilation was determined and the air change was found to be 0.85 instead of 1.5 per hour, which meant that, had the room been occupied by four persons, only 388 cubic feet of fresh air per head per hour would have been available instead of the minimum standard of 600. The air movement which should have been 20 to 40 ft. per minute was practically nil. The relative humidity in the room was found to be 75 per cent., namely 10 per cent. above the upper limit for comfort. These indoor climatic conditions had resulted from the excessive use of draught-excluding devices which almost hermetically sealed all windows and exterior doors. Moreover, the occupants had systematically

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FIG. 2.—Experiment in which the thermal comfort sensations of the occupants were studied in relation to changes in indoor climate due to heating, ventilation or variations in the ceiling height of rooms.

avoided opening windows and had, in fact, plugged air-brick orifices with paper to prevent draughts. They claimed that owing to fumes they could not light fires. This was no doubt true because a fire will not draw and a chimney flue cannot function properly unless air can enter the room at the rate demanded by the hot gases and fumes ascending the chimney.

DAYLIGHT, SUNLIGHT AND ARTIFICIAL LIGHTING

Adequate daylight penetration into rooms is essential for visual comfort and the efficient performance of a wide variety of domestic tasks, the nature

of which determines the distribution and intensity of illumination required.

In this connexion the relevant codes of practice take into consideration the depth of penetration of direct daylight from the sky on a working plane 2 ft. 9 in. above floor level, and the area of the room illuminated by a

TABLE 3

MINIMUM DAYLIGHT STANDARDS				
Room	Size	Sky Factor	Penetration	Daylight Area
Living room	150 sq. ft.	1 per cent.	8 ft.	75 sq. ft.
Bedroom	120 sq. ft.	0.5 per cent.	9 ft.	60 sq. ft.
Kitchen	100 sq. ft.	2 per cent.	6 ft.	50 sq. ft.

definite minimum percentage of the light which it would receive from an unobstructed hemisphere of sky, i.e., out of doors in the open. This percentage is termed the Sky Factor (formerly known as the Daylight Factor). The Sky Factors recommended in table 3 are based on data which show

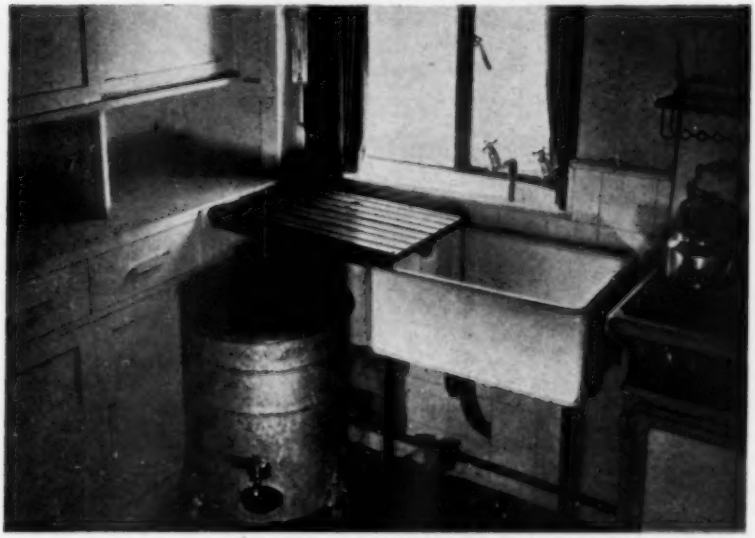

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FIG. 3.—The effects on the occupants of changes in room climate due to the operation of washing and cooking installations is one of the problems of housing which is under investigation.

that although there are wide variations in the intensity of daylight, a figure of 500 lumens/per square foot (formerly foot candles) for external illumina-

tion may reasonably be adopted as a basis for calculating minimum standards of daylight requirement for rooms.

Thus in the case of the kitchen, if the external illumination at the time was 500 lumens per sq. ft., an area of 50 sq. ft. at table height would be illumined to at least 10 lumens per sq. ft., an intensity which has been shown to be satisfactory for ordinary purposes (1 lumen = the light intensity 1 foot distant from a 1 candle-power source).

The actual amount of daylight penetrating a room depends upon the size and particularly the height of the window, and also the degree of obstruction due to neighbouring buildings. These and other problems are

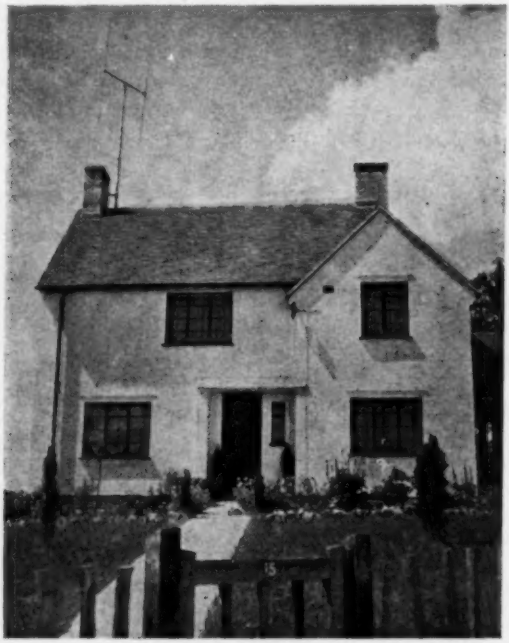

FIG. 4.—A house on a new housing estate in Sussex. The rooms are 7 ft. 6 in. in height. Casement and hopper windows and modern heating appliances enable accepted standards of ventilation and warmth to be maintained. The white exterior reflects approximately 70 per cent. of direct sunlight and thereby helps to keep the indoor climate comfortably cool in summer.

dealt with in the Code of Practice for Daylight, which also contains tables giving the depth of daylight penetration for windows of varying height and width.

In regard to the penetration of sunlight, it is recommended that the orientation of the house and the positioning of windows should permit the access of direct sunlight to living rooms in the afternoon, and kitchen and bedrooms in the morning, for at least one hour daily during not less than ten months of the year from February to November.

Whilst the nature of the visual task determines to a large extent the intensity of artificial illumination required, the avoidance of direct or indirect glare is a major consideration from the point of view of visual comfort as well as efficiency. It would be outside the scope of this article to deal more fully with daylight or artificial lighting, but attention should be drawn to the Code for the Lighting of Building Interiors drawn up by the Illuminating Engineering Society, and to the valuable textbook by H. C. Weston (1949), entitled 'Sight, Light and Efficiency', which interprets in a very practical way many of the findings of research carried out in recent years by the Medical Research Council.

CONCLUSION

It was pointed out by Clay in 1937 that housing needs will not be solved simply by the provision of sufficient numbers of houses satisfying the requirements of environmental hygiene which had, up to that time, been defined. He rightly held that the real human problem will be solved 'only by the provision of houses which, by their inherent qualities, satisfy the finer implications of the word "home"; houses, in other words, in which are incorporated such details of design, construction and equipment as are known to be essential to home making'. One has only to visit some of the new housing estates which have been completed since the war to realize that 'ideal homes' for families, the basic social units of the population, have been designed and are being provided in vast numbers. Further, that in their siting, orientation, construction and equipment, the fullest possible consideration, according to present knowledge, has been given to family needs by the authorities and by the architects, builders and engineers whose concern it is to provide homes which are more than shelters from the weather.

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Figs. 1, 2 and 3 represent studies on housing requirements for health and comfort carried out for the Ministry of Works and the Building Research Station of the Department of Scientific and Industrial Research.

ISONICOTINIC ACID HYDRAZIDE

By A HUMAN GUINEA-PIG

To expose one's carcase in the market-place is usually a form of exhibitionism, consciously designed to impress or horrify the spectators, unconsciously to give fortitude to the exhibitionist, each recitation of 'My Operation' or 'My Illness' making him or her feel more strongly, 'I am not such a worm after all'.

To exhibit the action of a new drug, however, on one's carcase, with all the exclusive and inside information which the possession of a pathological lesion gives, may amount almost to a duty. Besides, at the age of sixty-one when men get a little careless in their dress, or a little more careful because they realize that they don't really care a button or two what anybody thinks, any coyness or selfconsciousness is entirely out of place.

This then is an account of the action of isonicotinic acid hydrazide for one month on a man of sixty-one with an old, but active and progressive tuberculous lesion in the relic of his left lung.

PAST HISTORY

The first symptom of pulmonary tuberculosis in this guinea-pig was in December 1914, when he coughed up a little blood-streaked sputum. Being a medical student and having just finished his course in the Tuberculosis Department, he decided the incident was too serious to be taken seriously, never mentioned it to anyone, and dismissed the matter from his mind. Four months later he had an hæmoptysis of a few ounces, which, as an hæmoptysis is intended to do, frightened him and reduced him to the humble state of patient. Then followed fifteen months in a sanatorium where, as there was a war on, he acted also as A.M.O. A sub-apical, left-sided, exudative lesion with copious sputum and occasional bouts of febrility slowly got worse; in the light of later experience, because the guinea-pig was very ambulant, I don't see how it could have been otherwise. In November 1915, he was one of the early recipients of artificial pneumothorax (A.P.T.). These were the days when A.P.T.s were A.P.T.s, the idea being to squash the lesion and the flatter the better; no ladylike letting it subside by its own lack of elasticity, for these pioneers. When on one occasion a refill of 2,200 ml. drove the apex beat to shelter under the right nipple they thought they were doing extraordinarily well. He was allowed to swim and made the whimsical discovery that he couldn't sink and if he dived he came up on one side like a maimed fish. Anyhow, the A.P.T. did the trick and in six months' time he was able to leave the sanatorium, although he kept up the A.P.T. for a few months more, nine months in all. Thereafter he went to sea for fourteen years and had only very occasional blood-streaked sputum, generally after severe exercise. At the end of 1928,

the old lung started to break down again, and by the summer of 1929 there was a large cavity, ripe for thoracoplasty. He had the phrenic avulsion, ten-rib-cut in two stages affair, and was apparently well in two months. He stayed well for twenty-two years, with rare sanguineous reminders, but never a day in bed.

HISTORY OF PRESENT ILLNESS

In August 1951, he woke up with an acute pain across his chest. At first this seemed to be muscular and no notice was taken of it. In two or three days, however, it settled down on the left side, and for the first time for years there was regular sputum. Gradually there developed signs of toxæmia, aching of the limbs, evening temperatures, mild night sweats, and increasing sputum, which was positive on culture only at first, but later on direct smear. Slowly these symptoms increased up to Christmas. He had several courses of penicillin, a million units a day, which seemed to check the temperature a little, the secondary infection being mainly *Strep. viridans*. He tried PAS, but it made him so sick that he abandoned it in a few days. In January he went to a great chest hospital. The sputum then was three to four ounces, muco-purulent, and scantily positive, the erythrocyte sedimentation rate, 80, and the evening temperature up to 101° F. (38.3° C.). A bronchoscopy revealed an atrophic bronchus and quill-like bronchi which exuded pus. The X-ray showed that the right lung was all right and that the remnant of the left lung was a calcareous chain; the surgeon felt disinclined to go quarrying. The guinea-pig was returned home, definitely one of the morituri, but they put it more nicely. The next two months showed a gradual deterioration, any marked activity being paid for by increased fever, sputum, and what is variously called apathy, lethargy, or toxæmia, but what is really a form of toxæmia acting on the brain in a specialized way, like morphine or alcohol, both of which it somewhat resembles in its action. As this seems to be little understood it deserves a more detailed exposition. When poor little John Keats wrote:

> 'My heart aches and a drowsy numbness pains
> My sense as though of hemlock I had drunk'

it wasn't really the nightingale that inspired him, but the toxæmia from his exuding lung. Probably the first signs of all toxæmias are mental, if only we knew what to look for and how to elicit them. The tuberculous toxin acts as most toxins do, but with varying emphases, regressionally, i.e., the patient thinks more as a child does, in coloured pictures, imaginatively, and, if in words, then those words are more or less musically or metrically arranged; compare the sing-song of the doric and the abundance in it and in child-talk of onomatopœics. In small doses the tuberculous toxin gives a pleasant toxæmia. If, however, the patient is ambulant with an active lesion, if he is getting large doses of the toxin, severe mental symptoms may appear, even delusions, and his judgment is dethroned.

To return to our guinea-pig. At the end of March he was getting enough of this toxin to drive him most willingly to bed soon after lunch, and when he got there he was too pleasantly slack to read. He was quite content to lie there and dream dreams and hear voices in metrical words. This, of course, is the origin of the *spes phthisica*; it is very like the *spes alcoholica* or *morphinæ*. On April 1, he had an anaphylactic shock on starting a new course of penicillin, urticarial blobs appearing in a few minutes. He became unconscious, but probably not for long, and had recovered in a few hours.

Here then you have on the one hand a race of tubercle bacilli which had survived for many thousands of generations, for thirty-seven years, in one lung; on the other hand, their host who by various limiting processes, by fibrous tissue and by chalk had sought to confine them. Now at the time of the male climacteric or at any rate of the waning of the endocrines they were trying to break out, and succeeding; a not unusual event at this age.

O RIMIFON!

On April 2, one hundred 'rimifon' tablets arrived unexpectedly. The first reaction, characteristic of the state, was to notice what a harmonious word it is (so is the sad consumptive's rescuing bride, isonicotinic acid hydrazide). He took three tablets a day at eight-hourly intervals, 150 mg. all told, the tuberculous part of him greeting them as the Messiah, the other part, dominant in the afebrile morning, remembering a sentence from the latest American paper he had read on the subject: 'The results in ordinary sanatorium cases are not impressive'. Nothing happened in the first week except a slight lessening, perhaps, of toxicity and a mild but definite apprehensiveness about nothing in particular. On April 9, he went on to five tablets a day, one every four hours except between 8 p.m. and 4 a.m., which worked out to about 4 mg. per kg. body weight. On the third day of this week he became afebrile and for the first time for months had no night sweat. He has remained afebrile since, and the night sweats have not come again. The most notable result which has progressively made itself felt since the second week is the lessening of the toxicity; no longer do the legs ache and that narcotic languor steal over one in the afternoon, no longer does one creep up to bed with *The Times* after lunch, hardly to look at it, but to dream dreams and see visions. There has been an alteration in the mental perceptiveness, too, for whereas in the last days of March he could scan the crossword as though it were under a Hittite monument, not a clue to a clue, now he can generally pick his way through it, reserving the solutions that he definitely does not know, like 'Agamemnon's Aunt', to be looked up afterwards. It has been a joy to feel the muscular power of the legs return and to know that one can go and hoe round a tree or clip a hedge or even dig a bit without having to pay for it with spit, temperature and toxicity. The sputum has come down to about a quarter of what it was and is less purulent; it is nearly all in the night. The nights used to be interrupted every half-hour to void sputum, and sleep was possible only by lying on the diseased

side. Now he can lie on either side and the last few nights have been the best he has had for months.

The slight apprehensiveness, which is probably part of the hyperreflexia the American papers note, is never far away; the central nervous system scenting a toxic stranger. It has found something to attach itself to, an old weakness, a dread of noise, which itself comes from the fact that the guinea-pig since childhood has had only one functioning ear, so the other has to be for ever alert.

Twice he has tried taking six tablets a day instead of five, taking two at eight p.m., which brings the total daily dose to over 4.5 mg. to the kilogram, and on each occasion the apprehensiveness from being a minor, scarcely noticeable symptom, has become definitely unpleasant, a feeling of being 'on edge', as though he had drunk too much coffee, which, I suppose, is a sign that at that dosage the drug is toxic to him. The waking pulse which always used to be about 50, but has been well into the sixties for the last few months, is now 56. The body weight has been unaltered throughout the illness. He has had no bowel or urinary symptoms.

Before the coming of 'rimifon' the guinea-pig was having an autogenous vaccine of *Strep. viridans* and *M. catarrhalis*, each dose of which caused a local and general reaction; since taking rimifon he has had two injections without any reaction. After finishing the 100 rimifon tablets (Roche) he went on to isonicotinyl hydrazide (May and Baker); they are, of course, different brands of the same chemical.

SUMMING-UP

After one month's treatment with isonicotinic acid hydrazide this guinea-pig asserts that he feels very much better. He gets up at 6 a.m. and goes to bed at 9.30 p.m., he potters about or reads or drives all day, which he hasn't been able to do since last August. He is afebrile and his sputum is about a quarter of what it was. It is an incredible improvement in a short time. All these observations will be commonplace in a few months. We have still to find out the criteria for stopping the drug, whether, when it is stopped the T.B. eleven comes back for another innings, and if so, whether that eleven will be more cunning in dealing with isonicotinic acid than they were before.

EPILOGUE

To experiment means 'to find out thoroughly by trial' and I hope 'thoroughly' will be interpreted so that all conditions are included, the endocrinely undisturbed at home, the exiled in sanatoria, the ambulant, the workers, the bedridden, all of whose mental states are influenced by where they are and what they do, and are as much a matter of chemistry, endocrinal chemistry, as this drug they shall encounter. And when the Great Collation of all known facts takes place it may well be that it is under these headings that the differences of response are most noticeable. Meanwhile, my little experiment, that of an elderly, ambulant man who lives alone happily in the country, continues. C.G.L.

FREQUENCY AND DYSURIA IN THE FEMALE

By HOWARD G. HANLEY, M.D., F.R.C.S.

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A NORMAL adult female should be able to retain urine in her bladder for at least three hours, and the act of micturition should be voluntarily controlled and painless. In between such acts, she should not be conscious of possessing a bladder or urethra, nor at night should she be awakened by a desire to pass urine. Unfortunately these simple standards cannot always be attained, and some disturbance of micturition is one of the most common complaints of female patients, so common in fact that many women accept it as their lot, and do not even seek advice. It is important to remember that frequency and dysuria are merely symptoms, and are not a disease in themselves, so that the indiscriminate provision of an alkaline mixture and chemotherapy is seldom in the patient's best interests unless adequate investigations are subsequently carried out.

Contrary to general belief, the pathological causes of frequency or dysuria are limited. Urine is stored in the bladder and passed out through the urethra, so that from first principles, it is these two organs only which can influence this storage or passage. Any reduction of the bladder capacity or alteration of muscular tone will call for increased frequency of emptying, whilst severe spasm or ulceration may cause suprapubic pain and tenderness. Irritation of the urethra will cause discomfort or pain associated with micturition; if the trigone is also involved there will be increased frequency due to reflex bladder irritability.

THE BLADDER

Alterations in bladder tone can result from interference with the neuromuscular mechanism of micturition either by spinal injury or disease, but this is rare, and local irritation is the chief cause of bladder symptoms. The bladder itself is very resistant to infection, and unless the mucosa is damaged there will be no alteration of vesical tone and therefore no increased frequency. An infected urine *per se* will not damage the bladder provided there is no obstruction to the emptying mechanism, and one has seen thick pus from a pyonephrosis emerging like tooth paste from a ureteric orifice without causing any symptoms of abnormal micturition. A small quantity of infected residual urine resulting from obstruction will, however, rapidly cause a cystitis, the effect of which is to produce spasm or contraction of the muscular wall so that the capacity of the bladder is reduced. Under certain conditions this becomes a permanent feature, with fibrous tissue replacing

muscular tissue, and the so-called 'systolic' bladder of advanced tuberculous cystitis is the extreme example.

Most unfortunately, bladder growths cause practically no irritation until they ulcerate or become covered with phosphates, whilst simple pressure from without, e.g., by uterine fibroids, seldom causes any bladder symptoms unless the urinary outflow is obstructed, but inflammatory changes such as appendicitis or diverticulitis can infiltrate through the wall and may cause a local cystitis. Excluding tuberculous cystitis, which is generally secondary to renal disease, and such unusual lesions as Hunner's ulcer or phosphatic encrustation, a primary cystitis is a rare condition and probably occurs only as a result of a foreign body or a grossly infected urine due to obstruction of the urinary outflow. Bladder neck obstruction in the female is certainly more common than was previously thought, but it is still a rare finding, with the result that vesical diverticula and calculi are uncommon. In fact, the routine cystoscopic examination of any large series of women with urinary symptoms will show that the bladder itself is normal in the majority of cases.

THE URETHRA

Urethral inflammation tends to cause discomfort before, during, or after the passage of urine, whilst urethral spasm when present may produce a constant desire to pass urine. The spasm of an acute urethritis may produce a degree of urgency which necessitates the patient sitting on the toilet for hours on end passing only a few cubic centimetres of urine at a time, or the spasm may be intermittent due to a small quantity of urine entering the urethra, which immediately attempts to expel this urine, causing precipitancy, sometimes amounting to actual incontinence. In general it can be said that only changes in the urethra or trigone will produce painful micturition.

These symptoms of frequency and dysuria are usually referred to as 'cystitis', but for a proper appreciation of the cause of the symptoms and the true pathology, this is a most unfortunate word since, as already stated, a primary cystitis is an extremely rare condition, especially in the female. In fact, the great majority of women complaining of frequency and dysuria have some minor pathology in the urethra and trigone—not in the bladder itself. This explains why women with severe symptoms of so-called 'cystitis' may have a clear urine, and why this may even prove sterile on culture if collected *via* a catheter.

GYNÆCOLOGICAL CHANGES

In the minds of many clinicians, the most common cause of urinary symptoms in women is some degree of uterine prolapse, cystocele or urethrocele, but this is less than a half truth. Admittedly a large proportion of the middle-aged women who suffer from these gynæcological disabilities also have

dysuria and frequency, but mere displacement of the bladder does not cause these particular symptoms, as is well shown by the fact that the surgical correction of prolapse or cystocele, though it may cure stress incontinence, will rarely relieve troublesome frequency or dysuria.

It is important to be quite clear on this point. The original trauma which caused the uterine prolapse or bladder descent may also have produced the changes in the urinary passages which cause the frequency and dysuria. Unfortunately, the urinary changes become chronic in nature and are not affected by the surgical restoration of the normal anatomy. This is why the majority of such women when seen by a urologist have no gynæcological abnormalities—these have already been cured. The exception to this is the patient who has had a severe pelvic infection or parametritis. Marked urethral changes are often found in these women, and unfortunately a total hysterectomy with removal of both tubes and ovaries does not appear to clear up the inflammatory changes around the bladder and urethra, so that they are most resistant to treatment.

CLINICAL GROUPS

When these women come complaining of their frequency or dysuria they can be classified into two well-defined groups, solely on their history. The first is characterized by an acute attack which subsides in a week or two, leaving the patient symptomless. Such an attack may be repeated at intervals. The second group is more chronic, the severity of the symptoms varies from case to case, but the patient is always very conscious of having a bladder or urethra. Although essentially chronic, the original symptoms not infrequently started with an acute attack, whilst repeated acute exacerbations generally punctuate the chronic course of the disease.

ACUTE URETHRITIS

Into the first or acute group go the majority of the younger women, including the newly married patients suffering from defloration cystitis or so-called 'honeymoon cystitis'. Such patients are far more numerous than is realized, but the symptoms are generally mild and of short duration so that medical advice is not sought. The more severe cases may be seen and treated by the general practitioner as 'cystitis', but the urologist rarely sees them until there have been several recurrent attacks.

The initial onset of symptoms is generally sudden, and the patient is seized with urethral pain and an urgent desire to micturate. The actual passage of urine is extremely painful, and even when the bladder is emptied the desire persists. In more severe cases, attempts at micturition produce only a few drops of urine at a time, whilst terminal hæmaturia is common. Sometimes dysuria is present without any frequency at all, particularly in adolescent women who say they can hold their urine for hours on end but are afraid to micturate. Under such conditions acute retention may develop.

In severe cases, the symptoms may be associated with marked constitutional effects lasting for several days, and may be the precursor of an acute pyelonephritis. In fact, the great majority of attacks of pyelonephritis seen in young women are preceded by an acute urethritis, so that any form of urethral instrumentation, even the collection of a catheter specimen of urine, should be avoided in the acute stage. Since it is impossible to foretell which patient with an acute urethritis will develop a pyelonephritis, it is much safer to confine them to bed if their symptoms are at all severe.

Etiology.—In practically all cases the cause of this acute urethro-trigonitis is an ascending infection from below. Local congestion or trauma can lower the resistance of the delicate urethral mucosa, and since the external meatus is bathed in a pool of infected mucus all day long, it is surprising that the urethra does not become involved more often than it does. I have known instances when a severe attack was precipitated by horseriding or cycling, whilst in a recent series, the onset of symptoms started immediately after marriage in 10 per cent., and within five months of marriage in 80 per cent. (Hanley, 1946).

Diagnosis and treatment.—The diagnosis of the acute case in a young woman is made largely from the history, the symptoms being typical. Apart from occasional suprapubic tenderness there are few physical signs, although the urine may be streaked with blood. In the very early stages there may be staphylococci or streptococci in the urine, but a coliform infection rapidly supervenes, though this is seldom severe or prolonged.

The treatment of this group is straightforward. Acute urethro-trigonitis is a self-limiting disease and will generally get better on its own, but the length and severity of the attack can be greatly reduced by abundant fluids, an alkaline mixture, and adequate sulphonamide therapy. It is important to continue the sulphonamides for a longer time, but in smaller doses, than usual, to avoid an early return of urinary infection. A suitable regime is sulphamezathine, 2 g. immediately, followed by 1 g. six-hourly for five days, then 0.5 g. six-hourly for a further ten days. Antibiotics are unnecessary and in many cases tend only to mask more serious urological pathology, such as congenital lesions. A careful watch should be kept for the onset of pyelitis; this can best be avoided by confining any severe cases to bed. A cervical erosion must always be looked for and treated when the acute phase has subsided.

The patient should be symptomless and the urine sterile in about three weeks, even in the most severe cases, but if this is not so, further investigation is essential. At the risk of being obvious it should be mentioned that symptoms of increased frequency are often the first signs of early pregnancy, but any degree of dysuria should be investigated, since an associated urethro-trigonitis can prove serious in pregnancy. In a consecutive series of 112 cases of pyelitis of pregnancy there was clinical proof of a preceding urethro-trigonitis in 55 per cent. (Hanley, 1946).

Of great importance in these young women is the early diagnosis of urinary tuberculosis, and in all cases in which the frequency persists especially at night, the urine should be inoculated into a guinea-pig or cultured for tubercle bacilli. A Ziehl-Neelsen stained slide is not sufficient to exclude tuberculosis.

Should the acute phase not subside rapidly, a search for the cause is essential. Foreign bodies or vesical calculi, and inflammatory lesions of the cervix, uterus, or adnexæ, will all prevent the symptoms resolving or will cause further exacerbations.

The woman with recurrent acute attacks, even if her urine is sterile in the intervals, has either a latent focus of infection or is being constantly re-infected, and when no general or urological abnormality can be found to account for the exacerbations, the husband should always be examined. A mild degree of chronic non-specific posterior urethritis is much more common in men than is generally realized (Harkness, 1950), and such couples can and do reinfect each other during sexual intercourse, because although there is generally no connexion whatever with gonorrhœa, urethro-trigonitis in most cases is venereal in its true meaning.

CHRONIC URETHRITIS

By far the largest number of women complaining of frequency and dysuria come into the second or chronic group. Many of the acute cases in young women do not settle down completely, and thus we have the typical example of the energetic woman in her thirties whose daily activities are limited by the need to pass urine at inconveniently short intervals, and who suffers from a varying degree of urethral discomfort. This chronic course, punctuated by acute exacerbations, may go on for months or years before the doctor, and certainly a urologist, sees her, unless she develops an attack of pyelonephritis. In older women, particularly towards the menopause, the onset may be slow and insidious without any definite history of an initial acute attack, but the established clinical picture is similar. The frequency in these women is often worse in the morning than later in the day, and although some degree of nocturia is common, it may be absent altogether. In cases in which nocturnal frequency is marked, or is the predominant symptom, a tuberculous infection must be excluded.

The dysuria varies in type from patient to patient. In the long-standing cases it is more often terminal in nature and there may be pain in the urethra lasting for anything up to fifteen minutes after the cessation of micturition. Some women complain that the actual passage of urine is painless, but if they attempt to hold their urine they experience suprapubic or perineal discomfort. This leads to prophylactic emptying of the bladder at perhaps hourly intervals, and is a spurious frequency. Such frequency becomes habit forming and may continue long after the local lesion is cured. In other cases true dysuria is often associated with urgency or precipitancy, which may be

so acute as to produce actual incontinence, whilst terminal hæmaturia is often the dramatic symptom which finally brings the patient to the urologist.

Folsom (1931) and Winsbury-White (1933a) have both drawn attention to referred pain from the female urethra, such as pain in the loin, groin, thigh, or suprapubic region. Folsom describes a special iliac fossa type where multiple abdominal operations have usually been performed without relief. I believe that many of these pains are due to an associated ureteritis which in some instances can be relieved by attention to the urethral condition (Hanley, 1946).

Although frequency and dysuria are essentially chronic complaints they are characterized by remissions and acute exacerbations, more often the latter. Some relationship to the menstrual cycle is usual, and many women find that their symptoms are worse just before the menses, although a smaller group have relief at such times.

One of the chief characteristics of this syndrome is the almost complete absence of clinical signs on routine examination. The urine is practically always clear and may even be sterile on culture; an excretion urogram is probably normal, and cystoscopy shows no evidence of a 'cystitis'. In a long-standing case, however, the external urethral orifice may be contracted, whilst careful cysto-urethroscopy will reveal quite typical changes around the internal orifice, sometimes involving the trigone. These include rigidity of the orifice, with irregular 'hillocks', described and so named by Winsbury-White (1939), and thin translucent polypi which may only be visible with an irrigating urethroscope.

The relationship to other pelvic lesions may not be so close as some textbooks indicate. In a series of over six hundred women, gross pelvic abnormalities were looked for in all cases, but rarely found. In fact, far more women had already undergone many types of pelvic operations without improving their micturition symptoms (Hanley, 1946). Whilst there are many instances of urethro-trigonitis in women who have no cervical erosion, the association between the cervix and trigone is now fully accepted (Winsbury-White, 1933b), and it is certainly a waste of time trying to treat the urethra without attention to the cervix if the latter is pathological.

Childbirth has often been blamed for the onset of this disability, but interestingly enough, in the series of cases referred to, normal delivery would not seem to have been an outstanding etiological factor. The majority of women in the twenty to thirty age-group were married, but although many of them said they were symptomless before they became pregnant, the percentage of childless women (53 per cent.) was high.

The menopause.—Frequency and dysuria at the menopause are commonly accepted as just another unfortunate but inevitable burden to be borne at this time. This is far from true. A careful history will show that many of these women have suffered from their chronic urethro-trigonitis for years, but it has become worse as the menopause approached. In such women the usual

local changes will be found on cysto-urethroscopy and will require the usual local treatment. Great relief can be given by prescribing small doses of œstrogens, and in those patients without marked local urethral abnormality this may be all that is necessary.

Senile urethritis.—In women well past the menopause, senile changes develop in the vulva and urethra which are notoriously difficult to deal with, and severe scalding micturition may not respond to local urethral treatment or endocrine therapy. Always in such cases there is a long history of untreated or unrelieved chronic urethro-trigonitis, and the most common finding is a marked contraction of the external urethral orifice.

Urethral caruncles, which are uncommon, give excruciating pain when touched, but are not a cause of frequency or dysuria.

DIAGNOSIS AND TREATMENT OF CHRONIC URETHRITIS

Diagnosis.—When confronted with a patient suffering from long-standing symptoms the history alone may be enough to make a provisional diagnosis. Intrapelvic disease, though not a frequent cause of the symptoms, must be excluded, the cervix must be examined and, when indicated, an excretion urogram should be obtained.

The final diagnosis, however, can only be made by cysto-urethroscopy. In many chronic cases, the external orifice is so contracted that gradual dilatation will be necessary before the smallest examining cystoscope can be passed. This finding is diagnostic of chronic urethro-trigonitis. It is most unfortunate that during the cystoscopy the typical urethral changes will not always be visible with the ordinary right-angled telescope, so that unless they are looked for with a panendoscope or urethroscope they may easily be missed, since the bladder is generally normal. In fact, the reason why many of these women become chronic sufferers is due to the paucity of clinical signs.

Treatment.—In the established chronic cases there is little that can be done in the way of treatment with urinary antiseptics, chemotherapy, or antibiotics, because the urine is seldom heavily infected and may even be sterile on culture.

In long-standing cases, particularly at the menopause or in senile patients when the external urethral orifice becomes stenosed, the patient can be promised marked relief of her symptoms merely by dilating the urethra. Repeated dilatation may be all that is necessary, but personally I have found that when polypi are present local diathermy treatment is much quicker and more lasting in its effects than dilatation alone. It is most important that instrumentation of any sort should not be carried out too frequently, once in six weeks usually being sufficient. Symptomatic improvement follows within a day or so of local treatment, but in cases in which the urethral changes are marked, the relief will only last for two to three weeks before the symptoms begin to return in a minor degree and the treatment has to be repeated.

This fact must be explained to the patient at the outset of treatment.

Experience shows that the longer a patient has had symptoms before seeking advice, the longer it takes to effect a cure, so that it is obviously important to begin with the young woman whose first attack does not subside rapidly, or who has had a second attack after an apparent cure.

CONCLUSIONS

To recapitulate, it may be said that young women who complain of acute attacks of frequency and dysuria are generally suffering from *acute urethro-trigonitis*, a well-defined clinical entity which can easily be diagnosed from a careful history. It is due in most cases to local inflammation or trauma, and is found in adolescent girls and commonly in young women after defloration or normal intercourse. It is characterized by recurrent exacerbations, often during pregnancy, and if not adequately treated may give rise to attacks of pyelonephritis, or may progress into the second or chronic group.

The '*chronic symptom group*' usually includes the slightly older women, and although essentially chronic in that the symptoms may persist for years, is characterized by mild exacerbations, some of which may lead to attacks of pyelonephritis, though the incidence of these decreases towards the menopause. A typical feature in the majority of these cases is the finding of a relatively normal urine, a normal excretion urogram and a normal bladder on cystoscopy. Although cystitis is a rare occurrence, typical urethral changes are present, but unfortunately in many cases these can only be detected with a urethroscope, and are thus easily missed during a routine cystoscopy.

This chronic urethro-trigonitis is very resistant to any form of therapy, particularly in the long-standing cases, which will require repeated local treatment to the urethra; but even when a permanent cure is not possible, considerable relief for long periods can be afforded to these women, and far too many of them are just left to suffer quietly without any adequate treatment being attempted.

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PRACTICAL PROBLEMS OF HIGH PROTEIN FEEDING

By E. M. SHIPLEY, B.Sc.

AND H. M. DUNDAS

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THE value of increasing the protein content of the diet is well recognized. An augmented protein intake is commonly recommended for patients who need 'building-up' before operation or who are convalescing after a serious illness. Patients with long-continued illnesses, for example, pulmonary tuberculosis, peptic ulcer, ulcerative colitis or nephrosis, may need a high protein intake, and a chronic ulceration of the skin may benefit from this therapeutic measure.

The purpose of this article is to consider the practical aspects of prescribing high protein diets, and particularly to draw attention to the use of dried milk protein preparations, which have now become generally available and which help to overcome the difficulties arising from food rationing.

At present some protein foods are still rationed, notably meat, eggs, bacon and some cheeses. They are generally available, and at the moment the cost to each individual is approximately 2*s.* 9*d.* per week. Occasionally, additional supplies of some of them are available and these will be discussed later. Full use must be made of the rationed protein foods. At present (while eggs are rationed) these provide approximately 15 g. of first-class protein per day. As the recognized average requirement of protein is 60 to 70 g. per day, it is apparent that other sources must be found to supplement the diet.

MILK

The most important source of unrationed protein is milk. It is readily available and is well tolerated by most people. It may be used in many ways, for example, as milk drinks, in puddings, in soups and in sauces, and it can therefore easily be included in the diet. Milk may be used also as a medium for the inclusion of fortifying agents, for example, dried milk (when available), milk foods, and milk protein powders. A drink consisting of 7 oz. of fresh milk, $\frac{1}{2}$ oz. of half cream dried milk and $\frac{1}{2}$ oz. of 'casilan' (milk protein powder), provides 25 g. of first-class protein, which is the equivalent in protein value to 3 oz. of steak. This should prove to be of great value during the present meat shortage. The use of whole protein powders must be considered more fully. They are the most concentrated form of supplementary protein and their uses are manifold. They may be used to supply additional protein to milk drinks, milk puddings, soups, sauces, gravies, mock cream,

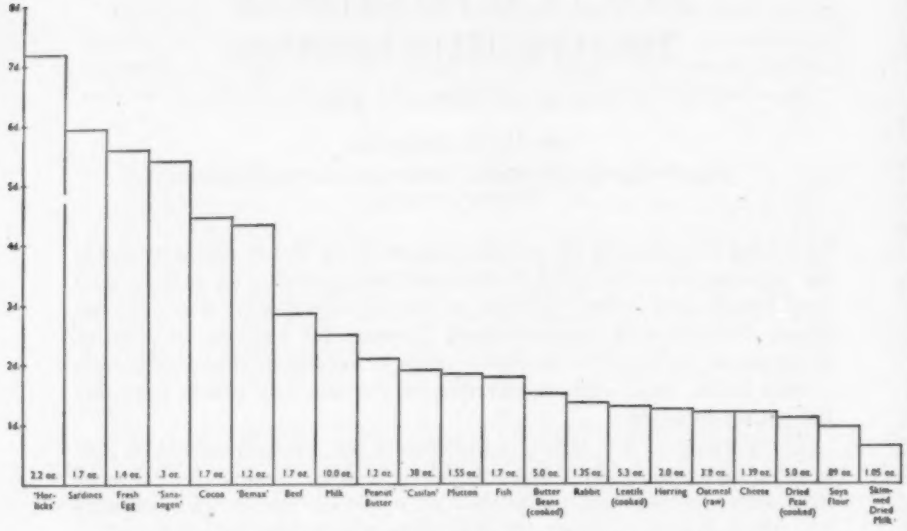

*CHART 1.—Comparative costs of portions of food containing 10 g. protein.

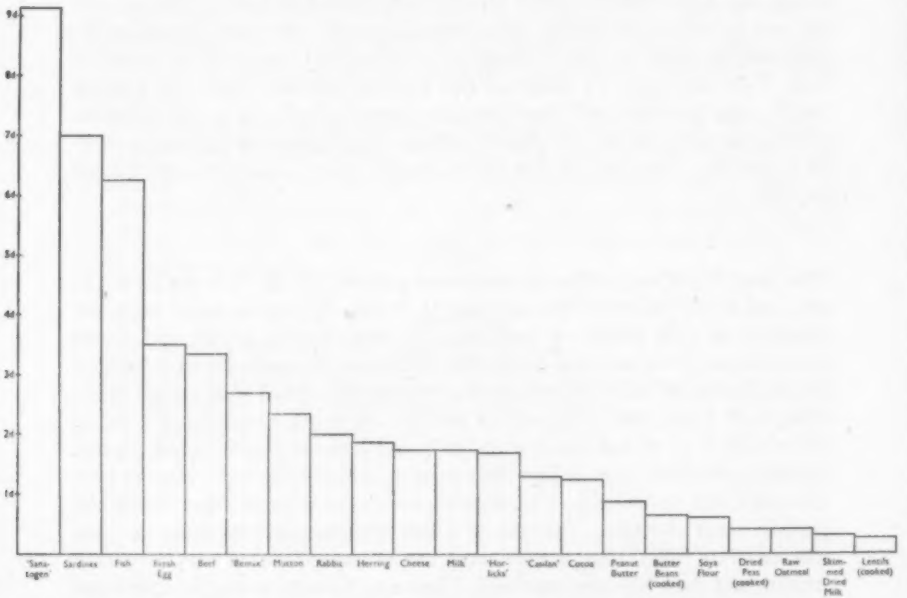

*CHART 2.—Comparative costs of average portions of protein-containing foods.

*Charts 1 and 2 are based on the retail prices in force in July—August 1951.

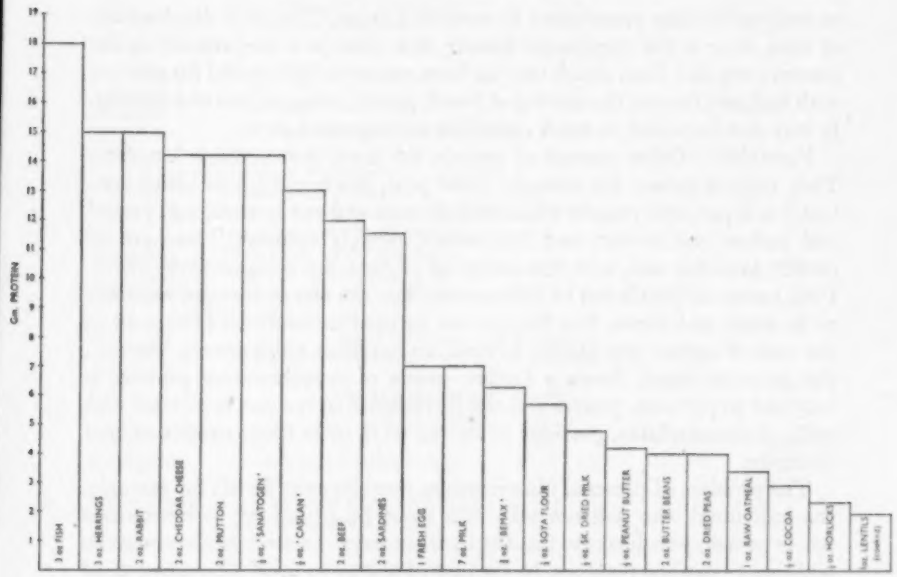

CHART 3.—Comparison of the protein content of average servings of foodstuffs.

and to fortify the liquid used in the mixing of cakes and scones and Yorkshire pudding. If well mixed and used in the correct proportions, they will not alter appreciably the flavour or consistency of the mixture. This also applies to other fortifying agents, for example, dried milk and evaporated milk.

OTHER SOURCES OF PROTEIN

Other obvious additional sources of first-class protein are unrationed meats, for example, rabbit, offal, ham, poultry and tinned meats. However, with the exception of rabbit, tripe and some tinned meats, these foods are either scarce or expensive. *Fish* may be used to provide protein of high nutritional value. This is true not only of expensive fish, but also of the cheaper varieties, such as herrings, kippers and smoked haddock. White fish tends to lack flavour and may soon cause monotony in the diet. This can be avoided to a certain extent by varying the methods of cooking used and by choosing different kinds of fish. The protein content of the cheese ration may be augmented by the use of unrationed cheeses. These are plentiful, but expensive.

The protein content of *soya flour* is remarkably high compared with other pulses; it is approximately 30 to 50 per cent. It has been used for hundreds of years in the Far East as an article of diet, but its use has only comparatively

recently come into prominence in western Europe. The chief disadvantage of soya flour is the unpleasant flavour, but there is a preparation on the market ('soyolk') from which this has been removed. It is useful for mixture with ordinary flour in the making of bread, pastry, cakes, scones and biscuits. It may also be added in small quantities to soups and stews.

Vegetables.—Other sources of protein are from the vegetable kingdom. They include pulses, for example, dried peas, beans and lentils which contain 6 to 8 per cent. protein when cooked; nuts and nut butters, e.g. peanut and cashew nut butter; and the cereals, notably oatmeal. These are all readily available and, with the exception of nuts, are comparatively cheap. Peas, beans and lentils can be incorporated into the diet as a second vegetable or in soups and stews. Nut butters can be used as sandwich fillings, or in the case of cashew nut butter, to make an excellent mock cream. 'Bemax', the germ of wheat, forms a further source of supplementary protein. It contains 30 per cent. protein and can be included in the diet as a cereal with milk, or on cornflakes, porridge or stewed fruit, or in fruit crumble or fruit charlotte.

The problem of personal idiosyncrasies must be considered; for example, the individual who will not take milk must be persuaded to incorporate whole protein powders into the diet in other ways—in fruit drinks and as an addition to mashed potatoes. In the case of allergy to milk, a modified dried milk (e.g. 'allergilac') should be substituted for fresh milk, thus maintaining the protein intake.

SUGGESTED DAILY DIETS

The following is a selection of high protein diets containing 120 to 140 g. of protein daily. (For 150 to 170 g. protein per day add a further 1¼ oz. of 'casilan'.)

It will be seen that the greater part of the protein content of these diets is derived from the 'fortified milk'. This is undoubtedly the essential basis of any high protein diet during the present meat shortage.

HIGH PROTEIN DIET 1

FULL DIET

		Protein in grammes
Breakfast:	Cornflakes 1 oz. or porridge (1 oz. oatmeal)	4.0
	'Bemax' ½ oz.	4.5
	Egg 1 or bacon 1 oz. or fish	7.0
	Bread 2 oz. (2 slices)	5.0
	Butter and marmalade	
	Milk from day's allowance	
Mid-morning:	Milk from day's allowance	
	Biscuit (or cheese roll if no breakfast eaten)	1.0
Dinner:	Meat, fish, offal, cheese, egg or bacon	10.0
	Potatoes 4 oz.	
	Green vegetables and peas and beans 2 oz.	2.0
	Milk pudding from day's allowance of milk	
	Fruit and 'bemax' ½ oz.	4.5

Tea:	Milk from day's allowance	
	Bread 2 oz. (2 slices)	5.0
	Butter and jam	
	Or nutbutter	
	Cake	
Supper:	Milk soup	7.0
	Fish, egg, cheese, tinned meat	7.0
	Potatoes 4 oz.	2.0
	Salad or vegetables	
	Bread 2 oz. (2 slices)	5.0
	Butter or nut butter	
	Milk from day's allowance	
Bedtime:	Milk from day's allowance	
	Ovaltine or Horlicks ½ oz.	2.0
Daily:	Milk 2 pints	40.0
	'Casilan' 1½ oz.	32.5

Total protein—138 grammes
(Minimum quantities—more may be eaten if desired)

HIGH PROTEIN DIET 2

SEMI-SOLID DIET

		Protein in grammes
Breakfast:	Porridge or scrambled egg	5.0
	Milk 7 oz.	7.0
Mid-morning:	Fortified milk 5 oz. (see recipe below)	23.0
	'Milo' or ovaltine ½ oz.	2.0
Dinner:	Milk soup 7 oz. or creamed chicken	
	Or rabbit 1 oz. or pounded fish 2 oz.	
	Or egg custard	7.0
	Mashed potato	
	Vegetable purée	
2 *p.m.:*	Milk pudding—milk 5 oz.	5.0
	cereal ½ oz.	
	'Casilan' ½ oz.	6.5
4 *p.m.:*	Fortified milk 5 oz. (see recipe below)	23.0
6 *p.m.:*	Milk soup 7 oz. made with 'casilan' ½ oz.	20.0
	Creamed chicken or rabbit 1 oz.	
	Or pounded fish 2 oz. or 1 egg	7.0
8 *p.m.:*	Milk pudding as at 2 p.m.	11.5
10 *p.m.:*	Milk 5 oz.	5.0
	'Milo' or ovaltine ½ oz.	2.0
	'Casilan' ½ oz.	6.5

Total protein—130 grammes

Fortified Milk Feed:

5 oz. fresh milk
½ oz. half-cream dried milk
½ oz. 'casilan'

HIGH PROTEIN DIET 3

FLUID DIET

	Protein in grammes
Milk 2 pints	40.0
'Casilan' 3 oz.	78.0
'Milo' or ovaltine 3 oz.	12.0
	130.0

5 oz.-feeds may be given two-hourly from 8 a.m. to 10 p.m. Eggs may be added to the feeds when available, thus raising the nutritional value of the feeds. Sugar or glucose may be added as desired.

HIGH PROTEIN DIET 4

LOW-SALT HIGH-PROTEIN DIET

		Protein g.	*Na* mg.	*Cl* mg.
Breakfast:	Porridge (no salt), or Shredded Wheat	3.0	4.7	20.2
	Milk 5 oz.	5.0	71.0	139.0
	Egg 1 or white fish 2 oz.	7.0	57.6	67.8
	Salt-free bread—2 slices	4.0	54.0	42.0
	Salt-free butter or margarine	—	Tr.	Tr.
	Marmalade	—	2.6	1.0
Mid-morning:	Fortified milk 5 oz. (see recipe below)	23.6	141.0	269.0
Dinner:	Meat or fish 2½ oz.	17.5	71.0	85.0
	Potato—cooked without salt	—	3.0	34.8
	Vegetables—cooked without salt	—	7.6	7.8
	Milk pudding—milk 7 oz.	7.0	99.4	194.6
	'Casilan' ½ oz.	13.0	—	—
	Cereal ½ oz.	—	0.3	1.3
Tea:	Milk in tea 5 oz.	5.0	71.0	139.0
	Salt-free bread—2 slices	4.0	54.0	42.0
	Salt-free butter or margarine	—	—	—
	Jam or salad	—	1.7	1.3
Supper:	Egg 1 or meat or fish 1 oz.	7.0	20.0	17.6
	Salt-free bread—2 slices	4.0	54.0	42.0
	Salt-free butter or margarine	—	—	—
	Vegetables as at dinner if desired	—	7.6	7.8
	Milk pudding as at dinner	20.0	99.7	195.9
Bedtime:	Fortified milk 5 oz.	23.6	141.0	269.0

Total protein—144 grammes
Total NaCl—2.5 grammes

Fortified Milk Feed:

5 oz. fresh milk
½ oz. half-cream dried milk
½ oz. 'casilan'

HIGH PROTEIN DIET 5

GASTRIC DIET

		Protein in grammes
6 *a.m.:*	Warm milk 5 oz.	5.0
8 *a.m.:*	Milk 5 oz. flavoured with weak tea	5.0
	Fine oatmeal porridge, 'Inglis' food or Robinson's groats with milk 5 oz. or egg	5.0
	'Bemax' may be added if desired	
	Bread and butter	2.5
	Jelly marmalade, honey or syrup	
10 *a.m.:*	Warm milk 5 oz.	5.0
	'Casilan' ½ oz.	6.5
	'Milo,' ovaltine or Horlicks ½ oz.	2.0
	Plain biscuit or rusks	
12 *noon:*	Vegetable milk soup 7 oz.	7.0
	Fish, egg, tripe, brains, chicken	
	Or light cheese dish approx. 2 oz.	14.0
	Mashed potato	
	Vegetable purée	
2 *p.m.:*	Milk pudding 5 oz. (made with milk 5 oz.,	5.0
	'Casilan' ½ oz., and cereal ½ oz.)	6.5
4 *p.m.:*	Milk 5 oz. flavoured with weak tea	5.0
	Bread and butter	2.5
	Jelly jam, honey or syrup	
	Sponge cake or plain biscuits	

6 *p.m.:*	Vegetable milk soup 7 oz.	7.0
	Fish or egg, as at 12 noon	14.0
	Bread and butter	2.5
	Vegetables as at 12 noon if desired	
8 *p.m.:*	Pudding, as at 2 p.m.	11.5
10 *p.m.:*	Milk drink, as at 10 a.m.	13.5
	Rusks or plain biscuits	

Total protein approx. 120 grammes

HIGH PROTEIN DIET 6

DIABETIC DIET. 150 g. CHO; 134 g. PROTEIN

		CHO	*Protein*
Breakfast:	Bacon or egg or fish		6.0
	Milk 7 oz.	10.0	7.0
	Bread 1 oz.	16.0	2.5
	Butter ½ oz. (approx.)		
Mid-morning:	Milk 7 oz.	10.0	7.0
	Horlicks ½ oz.	5.0	1.0
	'Casilan' ½ oz.		13.0
Dinner:	Meat 2½ oz. or fish 3 oz.		
	Or cheese 2 oz.		18.0
	Potatoes 2 oz.	10.0	
	Green vegetables		
	Pudding—Milk 7 oz.	10.0	7.0
	Cereal ½ oz.	10.0	
	'Casilan' ½ oz.		13.0
Tea:	Milk in tea 5 oz.	7.5	5.0
	Bread ¾ oz.	12.0	1.8
	Butter ½ oz. (approx.)		
	Salad or marmite		
Supper:	Meat 1½ oz. or fish 2 oz.		9.0
	Or egg or cheese 1 oz.		
	Bread 1½ oz.	24.0	3.4
	Butter ½ oz. (approx.)		
	Pudding—Milk 7 oz.	10.0	7.0
	Cereal ½ oz.	10.0	
	'Casilan' ½ oz.		13.0
Bedtime:	Milk 7 oz.	10.0	7.0
	Horlicks ½ oz.	5.0	1.0
	'Casilan' ½ oz.		13.0

Total CHO—150 grammes
Total protein—134 grammes

MRS. BEETON'S PREDECESSOR

WILLIAM KITCHINER, M.D. (c. 1775-1827)

By BRIAN HILL

For every thousand people who know the name of Mrs. Beeton as an expert on cookery and household management it is doubtful if there is one acquainted with that of Dr. William Kitchiner. Yet this medical forerunner of Isabella Beeton was a best seller in his day. His 'Cook's Oracle', published in 1817, went into no less than six editions in five years.

The full title of this book, which was the first really practical cookery book to be written, was 'Aspicius Redivivus or the Cook's Oracle', and it contained, according to the title page, 'Six Hundred Recipes, the results of actual experiments instituted in the kitchens of a physician, comprising a culinary code for the Rational Epicure'. This was no mere advertising puff. Dr. Kitchiner approached the subject of cookery in a truly scientific spirit: 'If medicine [he said] be ranked among those arts which dignify their professors, cookery may claim to an equal, if not a superior distinction; to prevent diseases is surely a more advantageous art than to cure them'. He not only read everything he could find on the subject, including 250 cookery books, but, by borrowing the services of Henry Osborne, chef to his old friend, Sir Joseph Banks, President of the Royal Society, he studied the practical side of his subject under an expert. As a result, he made himself a first-class cook. Moreover, he 'submitted to a labour no preceding cookery bookmaker, perhaps, ever attempted to encounter, having eaten each receipt before he set it down in his book'. No mean feat with a total of 600 recipes!

Kitchiner's special claim to distinction, however, as a maker of cookery books was his use of exact measures to replace the vague recommendations of previous authors—'a bit of this, a handful of that, a pinch of t'other'. In his own kitchen special graded measures were used, and he even tells his readers where they can purchase similar sets. Did the learned doctor, one wonders, get a commission on the sales of these useful kitchen gadgets?

Taking it all round, 'The Cook's Oracle' was an immense advance on existing cookery books, and it is not surprising that the housewives of the early nineteenth century agreed with the doctor's proud claim that his book was 'a *bona fide* register of Practical Facts'.

HIS HOSPITALITY WAS FAMOUS

Dr. Kitchiner was about forty years old when he published 'The Cook's Oracle', for he was born about 1775—the exact year is unknown. He had the more time to devote to cookery and authorship since he did not practice medicine.

His father, a self-made man, had risen from a porter to a successful coal merchant, a Justice of the Peace and a tradesman rich enough to have his son educated at Eton. On leaving school young Kitchiner took his M.D. at

Glasgow, but as he never sat for the examination for the Licence of the Royal College of Physicians he was unable to practice in London. However, he inherited some £2000 a year which enabled him to devote himself to the study of science and the arts of cookery and music, and set him free to practise a hospitality which made him renowned in Regency London. His luncheons and dinners were the talk of the town. To the former only intimate friends, like Charles Kemble, the actor, Incledon, the well-known singer, and Dr. John Haslam, the medical writer, were invited.

COMMITTEES OF TASTE

The dinners were a much more ceremonious affair, for the guests on each occasion were a self-appointed 'Committee of Taste' which was expected to criticize and pass judgment on the dishes set before it. To assist their endeavours, in the centre of the table stood the 'Magazine of Taste'. This was an invention of the doctor's. It consisted of a cabinet containing bottles of every conceivable sauce and flavouring that a gourmet could wish for; whilst a drawer underneath held scales and weights, graduated measures, a corkscrew, a nutmeg grater and a small pestle and mortar.

At these Lucullian feasts punctuality was essential. Every dish must be cooked just so and brought to table at the right moment for its serving. There was no delay therefore when dinner was announced. The company moved into the dining room, the doors were closed and any unluckily belated guest was firmly refused admittance.

The doctor also held conversaziones on Tuesday evenings which were, according to a contemporary, 'frequented by all the choice spirits of the day'. A card prominently displayed on the mantelpiece told guests to 'Come at Seven; go at Eleven'. (A wag is said to have changed the last part of this admonition to 'go it at Eleven'. He probably found the doctor's door shut against him on subsequent Tuesday nights.) Conversation and music enlivened these gatherings, for Dr. Kitchiner was a musical enthusiast as well as a cook and epicure. He sang and gave imitations at the piano of some of his friends. On other occasions he 'sang some sacred music of his own composition . . . the words were the Lord's Prayer'. At the last party he gave, the guests were greeted by a spirited rendering by the host of Handel's 'see the conquering hero comes' on the piano.

Ladies were rarely admitted to these feasts of reason. When they were, the drawing room was thrown open; otherwise the guests assembled in the back parlour.

Astronomy was another of the entertainments offered at the doctor's London home at 43 Warren Street, off Fitzroy Square. He owned an incredible number of telescopes and the top of the house was fitted up as an observatory.

A VOLUMINOUS AUTHOR

Dr. Kitchiner's interests were reflected in his writings. He published two volumes on 'The Economy of the Eyes', with precepts for the improvement

and preservation of the sight. The second of these embodied the results of thirty years' experiments with 51 telescopes. His musical taste was displayed in a 'Life of Charles Dibden', the singer, and a collection of 'Loyal, National and Sea Songs of England'. 'God Save the King' was first published in the latter volume. Then there were 'The Traveller's Oracle or Maxims for Locomotion', full of sage advice to those who travelled on business or

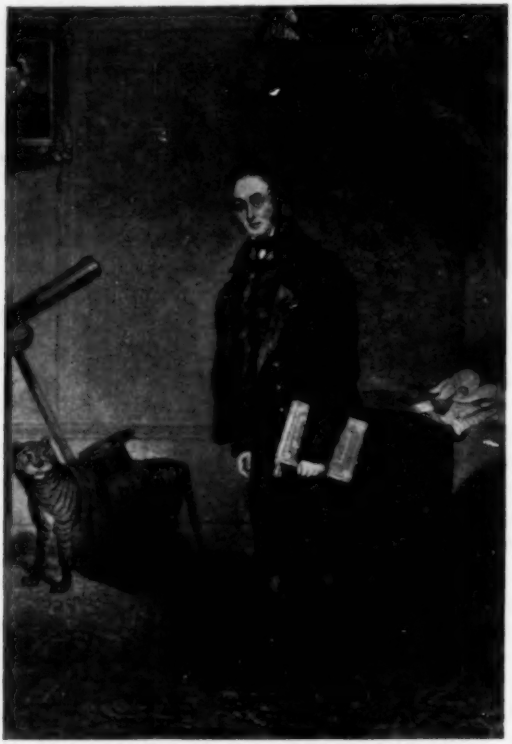

FIG. 1.—William Kitchiner, M.D. (1775-1827)

pleasure; 'The Housekeeper's Ledger' (which included an essay on the 'Pleasure of Early Rising'); and a volume with the lengthy, but intriguing title of 'The Art of Invigorating and Prolonging Life by Food, Clothes, Air, Exercise, Wine, Sleep, etc., or the Invalid's Oracle, containing Peptic Precepts, pointing out Agreeable and Effectual Methods to prevent and relieve Indigestion and to regulate and strengthen the Action of the Stomach and Bowels'.

The author respectfully dedicated this last-named work to 'the Nervous and Bilious', and, like his other books, it is full of well-meant advice, although perhaps to our minds Kitchiner's ideas on hygiene, diet and

medicine are somewhat oldfashioned. But, having recommended his own 'Peristaltic Persuaders' among the many things that would help to prolong life, the eccentric doctor concluded his book by a chapter headed 'The Pleasure of Making a Will', hardly the sort of thing to quiet or cheer his nervous and bilious readers. ('The Persuaders', incidentally, were pills made of a mixture of rhubarb, oil of carraway, and syrup.)

MAXIMS FOR COOKS

Many of Kitchiner's ideas on cookery were sound and still hold good. He complained, for instance, that cooks did not take enough pains; even simple cooking like boiling or frying was not as well done as it should be. 'For one plate of potatoes [he said] that comes to table as it should, ten are spoiled'. He would say no good word, too, for dishes out of season. Vegetables, as he rightly pointed out, are in greatest perfection when they are most plentiful. He dealt at length in his 'Cook's Oracle' with the theory and practice of the several methods of cooking. Roasting, for instance, must be done by radiant heat in front of a glowing fire—one can almost see the spit turning as one reads the words—and the cook should be as careful of the colour and appearance of her roasts as a fine lady is of her complexion at a Court ball.

Finally, he emphasized that good health depends to a great degree upon the proper preparation of food for the table. 'Among the multitude of causes which concur to impair Health and produce Disease [he asserted] the most general is the improper quality of our food'.

THE CAGE OF MATRIMONY

Chapters in the work also dealt with the principles of housewifery and that almost forgotten art, the services of a good domestic servant. By reading his book, he claimed, 'a young lady may learn the delectable Arcana of Domestic Affairs in as little time as is usually devoted to directing the position of her hands on a pianoforte or of her feet in a quadrille. This will enable her to make the Cage of Matrimony as comfortable as the Net of Courtship was Charming'. The doctor's own 'cage of matrimony' does not seem to have been very comfortable, for he and his wife soon agreed to separate. The bulk of his money was left to a natural son.

Kitchiner died suddenly from 'spasms of the heart' during the night of February 26, 1827, after returning home from a dinner party at the Baker Street house of his friend, John Braham, the famous singer. He was probably in his early fifties, although his son says he had just completed his forty-eighth year.

Another of his friends, Henry Angelo, summed him up as 'a worthy, but eccentric gentleman', and speaks of his 'manly virtues, sincere friendship and unfeigned piety'. His books, however, went into few new editions after his death. It is true that some of the recipes from 'The Cook's Oracle' were re-issued in 1861 in a volume entitled 'The Shilling Kitchiner', but by that time Mrs. Beeton was the undisputed monarch of the kitchen. The fickle housewives of England had forgotten her predecessor.

CURRENT THERAPEUTICS

LIV.—CORONARY DILATORS

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THE two most important factors influencing the amount of coronary blood flow are the inflow (aortic) pressure and the resistance of the coronary bed. The latter is dependent not only upon the state of contraction of the coronary arterioles but also upon the pressure exerted upon them from the exterior by the contracting myocardium.

During ventricular isometric contraction the coronary arteries do not fill and there may even be a small reflux of blood squeezed back into the aorta. When the aortic valves open and the aortic pressure abruptly rises, coronary flow is resumed. Later, although the aortic pressure falls, compression of the coronary blood vessels is considerably decreased and coronary flow increases.

From this it may be argued that as heart rate increases so the diastolic filling time will be reduced and the amount of coronary blood flow decreased. However, if each beat produces less compression of the coronary vessels, systolic filling may be greater than normal and offset the shortened diastolic filling time. Wégria and Keating (1949) have, in fact, found in anæsthetized dogs that tachycardia leads to a temporary decrease in coronary blood flow, but is shortly followed by an increase which may even exceed the control levels. Increases in cardiac output and work, at least in innervated heart-lung preparations, increase coronary blood flow. Greater force of ventricular contraction will clearly increase coronary resistance, but flow may be maintained at or above normal by a higher aortic pressure. Finally, both nervous and local influences may alter coronary blood flow by changing the resistance of the coronary bed. Thus vagal stimulation increases the resistance, whilst anoxia and various ill-defined products of myocardial metabolism decrease resistance.

It is therefore obvious that attempts to assess the effect of a drug in reducing coronary bed resistance do not greatly help in assessing the therapeutic value of the drug. As has been so clearly stated by Wégria (1951): 'What really matters is not the absolute amount of coronary blood flow, but the ratio between cardiac work and coronary blood flow'. A drug may also be beneficial if it can increase the efficiency of the heart by enabling more work to be done with the same amount of coronary blood flow, or with the same degree of oxygen extraction by the myocardium.

METHODS OF MEASURING CORONARY BLOOD FLOW

There have been numerous attempts to measure coronary blood flow in animals, and a few in man. The animal experiments have mainly been

carried out on such artificial preparations that translation of the results to human problems is of doubtful advantage. Some of the better known preparations are:—

(1) *The heart-lung preparation.*—With the aid of this preparation Starling and others have made observations of fundamental importance in the regulation of cardiac output, but in the study of coronary blood flow it has the disadvantage of loss of cerebral connexions. Anrep and Segall (1926) incorporated a perfused brain into this system, and their 'innervated' preparation has been of greater value.

(2) *Perfusion of isolated dog hearts in ventricular fibrillation.*—The object of these experiments was to study the effect of drugs on the coronary circulation without the influence of ventricular compression on the coronary bed (Katz *et al.*, 1938).

(3) Various *experiments in isolated hearts* in which the aorta was cannulated and the outflow of blood measured in the venæ cavæ.

(4) The *response of isolated rings of coronary arteries to drugs.*

(5) *Measurement of coronary flow in anæsthetized dogs by various electrical and mechanical techniques*, the most reliable of which is probably the rotameter.

(6) *Measurement of coronary flow in anæsthetized dogs by cannulation* of the coronary sinus, or catheterization of the sinus *via* the right auricle and use of the nitrous oxide method. The latter is based on the Fick principle and requires a knowledge of the arterial and coronary sinus nitrous oxide content, and of the uptake, or release of nitrous oxide (if previously saturated), of the area of myocardium drained by the coronary sinus in unit of time (Eckenhoff *et al.*, 1948). In unanæsthetized dogs and man the nitrous oxide technique has now been well tested, and is probably accurate for measurement of flow per 100 grammes of left ventricular myocardium (Bing and Daley, 1951).

With all these techniques, it is often impossible, however, to decide whether coronary blood flow has been increased by particular drugs by alteration of coronary resistance, aortic blood pressure, cardiac work or efficiency.

These methods have been listed and their disadvantages stressed in order that those who adopt the clinical approach to the problem of assessment of vasodilator drugs may have some comfort in their laborious and unpromising efforts. Clinically, the usual approach is to select patients suffering from angina pectoris who develop pain on effort after approximately the same amount of exercise. They are asked to climb up and down a standard step, and the number of steps which they can manage before pain comes on is counted before and after giving a vasodilator. At the same time the effect of the drug on delaying the onset of abnormal electrocardiographic patterns is assessed. A similar type of approach is to administer 10 per cent. oxygen by mask and calculate the time required for pain to develop before and after giving a vasodilator. In both these tests placebos can be substituted for the

vasodilator. Unfortunately there is no such condition as 'stable' angina pectoris, and the amount of exercise taken depends very much upon the patient's mood, the temperature, the optimism of the examiner, and probably the very nature of the condition. I still have a delighted patient attending hospital regularly for the placebo he was given in a trial of vasodilators which ended three years ago.

Clinical impression as opposed to investigation is still probably the best method of assessing the value of vasodilators in man, however disheartening this must be to research chemists.

SOME CORONARY 'VASODILATORS' IN CURRENT USE

Clinical impressions, however, can be misleading in the field of therapeutics, and nowhere is this better illustrated than in the case of angina pectoris. To discuss all the vaunted remedies for this condition would be neither useful nor edifying. All that is proposed therefore is to review the more efficient, and the more commonly used preparations.

THE NITRITES

Inhalation of amyl nitrite in experimental animals increases coronary blood flow, produces tachycardia, and lowers the arterial pressure. Nitroglycerin, when given by mouth, increases coronary flow for about fifteen minutes. It also lowers arterial pressure, and if given in large enough doses this may drop so low that coronary flow actually decreases. Practically, inhalation of amyl nitrite is unpopular because of the attention it attracts from bursting the ampoule and dissemination of the vapour. Nitroglycerin should initially be prescribed in small doses, such as 1/200 or 1/130 grain (0.32 to 0.45 mg.), to be chewed, because in some patients the throbbing headache which it produces may persist long after rest would have led to spontaneous subsidence of anginal pain. Some manufacturers combine nitroglycerin in a pill with erythryol tetranitrate (dil. $\frac{1}{2}$ grain [32 mg.]) on the basis that the latter has a similar but more prolonged action than nitroglycerin. Although theoretically this should be an advantage, it is uncommon for patients to prefer such compound pills.

With these, as with other vasodilators, it must be stressed that they should not be administered in order that patients may take violent exercise immediately after using them. They are given so that patients may have prompt relief from pain.

THE XANTHINES

The best known of this group of drugs is theophylline ethylenediamine (aminophylline). This drug increases coronary blood flow and lowers aortic pressure in experimental animals. In man, it delays the onset of anginal pain of effort and decreases electrocardiographic evidence of myocardial ischæmia. It is doubtful if it decreases the size of experimental myocardial infarction. It is unusual for it to be tolerated without nausea when given by

mouth in doses larger than 3 grains (0.2 g.). Such a dose appears clinically to have remarkably little beneficial effect. When given slowly intravenously in larger doses (0.48 g.) pain may be dramatically relieved, but obviously this is impracticable routine therapy.

KHELLIN

Anrep *et al.*, in 1946, first reported a prolonged increase in coronary blood flow after introducing khellin (*Ammi visnaga*) into the heart-lung preparation. In the intact anæsthetized dog, khellin also increases coronary blood flow and does not greatly alter heart rate or arterial pressure. There have been many eulogistic and at least one derogatory report on the clinical usefulness of the drug. When given by mouth it is rapidly absorbed from the intestine and its action probably lasts several hours. The dose is 25 to 50 mg. ('benecardin', Benger) after every meal. In many patients, however, it is impossible to reach the higher dose because of anorexia and vomiting.

PAPAVERINE

Papaverine when given intravenously increases coronary blood flow, decreases blood pressure and increases heart rate. Because of this first action it is sometimes preferred to morphine for the immediate treatment of myocardial infarction, but its effect on blood pressure may well be hazardous in a patient with an already low pressure. There have been reports that the drug does decrease the size of experimental myocardial infarction.

MISCELLANEOUS DRUGS

Innumerable drugs have been used experimentally to assess their coronary vasodilating qualities, among which the more effective are acetylcholine, procaine and thyroxine. Ethyl alcohol may increase the amount of exercise that can be performed without producing anginal pain, but electrocardiographic changes of myocardial ischæmia are not prevented. Hence it is probable that alcohol diminishes pain sensibility.

Thus, after years of trial it must sorrowfully be reported that nitroglycerin has not yet been bettered as a coronary vasodilator and many of the frequently prescribed remedies are probably inert.

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REVISION CORNER

METRORRHAGIA

THIS term is applied to bleeding from the uterus occurring in the intermenstrual period. It is therefore applied to irregular bleedings only during the reproductive period of life. It is not correct to apply it to post-menopausal bleeding or to hæmorrhage during pregnancy, as menstruation is then in abeyance.

CLINICAL CHARACTERISTICS

Metrorrhagia may occur at any time during the reproductive period, but more than half of the cases are met with in patients over the age of thirty-five years, the majority of whom are multiparæ. The bleeding may occur cyclically or acyclically, usually the latter. When it is of the rare cyclic type it tends to occur on the same day of each menstrual cycle at the time of ovulation. In the major proportion of cases the bleeding takes place at any time during the intermenstrual period. It may occur without obvious cause or be brought on by muscular exertion, such as defæcation, or by contact, such as douching or coitus. The bleeding may be slight, when it is often spoken of as spotting, or profuse. It may last for from a few minutes to days or even weeks. The menstrual cycle may be unaltered or shorter or longer than normal. The loss at the menstrual period may remain the same or it may be excessive (menorrhagia).

CAUSAL FACTORS

Rarely, metrorrhagia is due to a disturbance of the physiological mechanism of menstruation, such as the occurrence of bleeding at the time of ovulation. In the majority of cases, however, the etiological factor is some pathological lesion in the genital tract. The bleeding is brought about by ulceration or necrosis opening up a blood vessel on the surface.

Carcinoma of the cervix is the most important cause of metrorrhagia and must be constantly kept in mind. This is a disease of middle life, at least 65 per cent. of the cases occur during menstrual life; 95 per cent. of the patients are multiparous. Characteristically the bleeding is slight in the early stage. The patient may say that she has noticed a spot of blood on two or three occasions in the intermenstrual period. The bleeding may have occurred in association with douching, defæcation or coitus. A history such as this always demands a careful pelvic examination, particularly of the cervix, and must include a speculum examination. Even when the bleeding has been slight, an advanced carcinoma of the cervix may be discovered, and unfortunately the majority of cases are seen at this stage. In an early case, inspection of the cervix may reveal a small raised nodule with a granular surface at the edge of the external os. The area bleeds when touched. A biopsy or curettage may be required to make the diagnosis, particularly in cases of adenocarcinoma of the cervical canal. On inspection of the cervix in these cases the vaginal surface appears normal, although the cervix may appear larger than usual. Blood will be seen coming through the cervical canal.

Chronic cervicitis (cervical erosion) is perhaps the most common of all gynæcological lesions during reproductive life, especially in parous women. When the erosion is large, or especially when it is vascular, the patient may complain of

spotting and contact bleeding. In most cases the diagnosis will be made on speculum investigation, but when the lesion is very vascular and there is much proliferation a biopsy will be required to differentiate the condition from a carcinoma of the cervix. The diagnosis is particularly difficult when the tubercle bacillus is the infecting organism. Tuberculous cervicitis is uncommon, but when it is of sufficient size to present symptoms the lesion may be papilliferous and closely resembles the far more common carcinoma of the cervix.

Cervical polyps may cause slight intermenstrual and contact bleeding. When they are large and protrude into the vagina they may cause continuous bleeding for several days or weeks. Endometrial polyps give rise to metrorrhagia, but the bleeding tends to be more marked and more profuse than with a cervical polyp. It is also not infrequently associated with menorrhagia.

Fibromyoma is the most common tumour of the uterus. One woman out of five over the age of thirty-five years has this tumour, either with or without symptoms. The most common symptom is menorrhagia, but metrorrhagia may occur when the fibroid is of the submucous or polypoid variety. The reason for this is that the surface of such a tumour ulcerates, becomes infected and may slough. Menstruation in these cases tends not only to be excessive and prolonged but the interval between the periods becomes shorter in many cases. It is important to remember that the metrorrhagia in cases of fibroids may be due to the presence of some other pathological condition, such as an endometrial polyp or carcinoma of the body of the uterus. One-third of the cases of cancer of the uterine body are found in association with fibroids. The possible coexistence of these two conditions should be kept in mind when a patient with fibroids presents with the symptom of metrorrhagia.

Sarcoma of the uterus gives the same clinical signs and symptoms as a fibromyoma. The rate of growth and presence of pain may lead to suspicion of this malignant growth.

Carcinoma of the body of the uterus is a more frequent cause of post-menopausal than of intermenstrual bleeding; about one-fourth of the cases, however, develop in the reproductive period of life. The bleeding tends to be slight but persistent. It is usually described as a bloodstained watery discharge. The diagnosis can only be made by curettage and histological examination of the curettings.

Tumours of the ovary rarely cause uterine bleeding unless some accident such as torsion occurs, or if they are one of the rare functioning types, e.g. granulosa cell tumour. *Tumours of the tube* are exceedingly rare. They occur more frequently after the menopause. The surface of the tumour necroses and bleeding occurs into the uterine cavity. It is slight in amount and continuous, and associated with pain localized to one or other side of the lower abdomen.

Two pregnancy conditions which cause uterine bleeding are often seen by the gynæcologist, with the label metrorrhagia. Although, as it has been pointed out, it is not correct to apply the term to hæmorrhages connected with pregnancy as menstruation is in abeyance, these cases often present themselves, as pregnancy has not been diagnosed or suspected. *Retained products of gestation* is the most common cause of uterine bleeding, probably because abortion, spontaneous and criminal, is so common. A careful history will elicit the cause of the bleeding, and examination will reveal an open cervix with slightly enlarged uterus. *Ectopic gestation* often presents as metrorrhagia. The delay of onset of menstruation may

be considered by the patient as unimportant, but the later occurrence of spotting usually makes her seek advice. This bleeding, together with delay in onset of menstruation and pain on one side of the lower abdomen, may lead to suspicion of an ectopic pregnancy.

TREATMENT

The treatment of metrorrhagia depends upon the cause. The diagnosis in many cases is easy with a careful history, abdominal, bimanual and speculum examination, but in some cases a biopsy and/or curettage is necessary.

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EARLY PULMONARY TUBERCULOSIS AND THE GENERAL PRACTITIONER

EVERY day the general practitioner encounters a host of symptoms which could classically be those of pulmonary tuberculosis. To guide him in forming a diagnosis he can take account of his patient's age, sex, race, occupation together with social conditions, family history, and past illnesses. The purpose of this article is to attempt a survey of the more important symptoms and signs which, perhaps in conjunction with other information, may render the reasonable possibility of pulmonary tuberculosis such that radiography of the chest becomes imperative.

SYMPTOMS

Despite the presence of progressive pulmonary tuberculosis the victim may not be aware of anything wrong. Usually, relevant symptoms can be elicited. They may be divided into two groups—those which at once suggest the lungs as the seat of disease, and those expressive of toxæmia.

Prominent in the first category is the complaint of *cough*. The general practitioner is not readily impressed by a cough. This is not surprising. Coughs echo about him day and night. Half the time he is coughing himself. Nevertheless, he will do well to stop and ask himself from time to time whether he can be quite sure that some particular cough is indeed innocent. 'Smoker's cough', that term so favoured by patients, should be recognized by the doctor only with great caution. Such a cough, it should be remembered, is the mark only of a considerable and chronic addiction. Brock and others maintain that a persistent cough is the most common early manifestation of carcinoma of the bronchus. It is perhaps less often the first symptom of pulmonary tuberculosis. Yet if it should be found to have arisen recently in a person previously little subject to coughing, in particular if it should present as a sequel to what had been taken for a 'cold' or an 'influenzal' attack, then plainly it demands further investigation. The recent history in such a case may be all important. From his knowledge of the patient and his circumstances the general practitioner is in a better position than any other doctor to form a sound judgment. It must be remembered too that a 'chronic cough' may be due to fibroid tuberculosis, or to tuberculous change in

the lung of a silicosis victim. Often in these circumstances it happens that the first hint of tuberculosis comes from the death of a child from meningitis.

Examination of the *sputum*, if any, may help. Inquiry may elicit a reluctant admission that it is all being swallowed. This is particularly common among children and young women. In the early stages of pulmonary tuberculosis the spit is mucosal in character. 'Nummular' sputum consists of caseous material; it is therefore diagnostic of cavitating tuberculosis. A productive cough often persists, even though the disease has become inactive, in consequence of the secondary bronchiectasis.

Blood which appears during coughing, however small it may be in amount, should always, in the absence of a clearly demonstrated alternative source, be assumed to have come from the chest. '*Hæmoptyses* [remarks Livingstone, crisply] do not arise from the rupture of a small vein in the pharynx.' Here, then, the practitioner's task is simple. An X-ray of the thorax, both in the postero-anterior and lateral views, is essential. Its omission may fairly be regarded as negligence. In differentiating the hæmoptysis of pulmonary tuberculosis from hæmatemesis, immediate evidence in favour of the former is afforded by affirmative replies to the following questions: Did the patient believe the blood to be coughed up? Was it bright and frothy, rather than of 'raw liver' appearance? Did the sputum remain streaked with blood for some hours afterwards?

Another symptom which may at once draw attention to the chest is *thoracic pain*. For reasons not well understood, continuing intercostal tenderness, quite apart from 'pleuritic' pain, may be an early indication of pulmonary infiltration. Occasionally the disease may present with the manifestations of spontaneous pneumothorax; it should be added that, usually, this condition is not tuberculous.

The second main group of symptoms are those deriving from toxæmia. Complaints which should at once excite suspicion include unexplained *loss of weight*, *impairment of appetite*, *excessive sweating*, and *amenorrhœa*. The patient may have his own explanation. He may contend that he feels 'run down', adding that he thinks he has been overdoing it. The young nurse, factory girl, typist, or domestic servant who has recently developed pulmonary tuberculosis often gives a story which suggests a mild anxiety state. All too easy is it then for her doctor to accept her tale at its face value and ascribe her troubles to 'maladjustment' in her job, or to some small '*chagrin d'amour*'. Young has pointed out that it should always be considered abnormal for a young person to complain of feeling persistently tired.

Finally, pulmonary tuberculosis may not produce any symptoms. Some would dispute this, yet the fact surely is plain, not merely in the sense that the sufferer must bear the disease for an appreciable period before it can produce subjective effect, a truism that must apply to every malady, but also in the more significant implication that the mischief may indeed be far advanced and still fail to make its presence felt. Such a situation is familiar to all workers in mass radiography units.

I once went with some care into the past history of a group of young sailors in whom pulmonary tuberculosis had been detected by a routine X-ray examination. Even when their confidence had been gained, after some weeks of treatment, many of these young men professed themselves to be mystified and incredulous about the abrupt change in their fortunes. They were invited to think back carefully to the last months before their 'pick-up'. Leading questions were put. Very often they could recall nothing whatever that had seemed to be wrong with their health. One young rating with a dorsal lobe cavity the size of an

orange had reached the final of his unit boxing competition on the day his disease was discovered.

SIGNS

Active pulmonary tuberculosis is often unaccompanied by physical signs. This simple truth is not even now universally appreciated. It demands emblazonment in the consciousness of every practitioner. Commonly there are pyrexia and tachycardia, with a raised erythrocyte sedimentation rate. There may be anæmia. Nevertheless, even when the disease is severe, it may be impossible clinically to detect abnormality in the chest. It is a pity that all general practitioners cannot on some occasion witness a salutary ritual that takes place from time to time at a famous chest hospital. One of the house physicians will invite his chief to decide on clinical examination which side of a patient's chest contains disease. Very often the consultant is forced to confess that he can detect nothing clinically. The house physician then produces the wet X-ray films taken that afternoon. No one is surprised if they should show extensive unilateral infiltration. Auscultatory findings depend upon air entry. If air cannot reach the affected part of a lung the utmost that physical examination can be expected to reveal is a diminution of movement and breath sounds. Fine crepitations above the bases, persistent after coughing, though highly significant if found, are frequently unobtainable. It follows that no doctor can exclude pulmonary tuberculosis by clinical methods. To have a suspicion of the disease, and then to pronounce against it after putting a stethoscope on a patient's chest, is to practice a self-deception which continues to lead directly to many avoidable deaths.

CONCLUSION

The possibility of pulmonary tuberculosis can be easily overlooked, even in the presence of several of its likely indications. Its identification demands constant vigilance. Inevitably the general practitioner must occasionally miss it. Moreover, if his criteria of selection be reasonable, it is certain that he must send for radiography many whose lung fields prove to be clear. Only rarely, however, should active disease escape him.

Finally, let me quote the following example, both in summary of the classical background of this malady and in warning of the pitfalls which attend its diagnosis.

There came one day to a hospital out-patient department two girls of twenty-two. One of them gave a family history of tuberculosis. By day she worked in a factory. Most evenings she went to the local dance hall. For some time past she had been feeling increasingly weary. Her appetite was poor. She had begun to cough and to produce a little sputum which on several occasions had been flecked with blood. She was pale and had lost weight. Her girl friend was there to keep her company. For the fun of the thing this friend asked to have her chest X-rayed too. The first girl's film was clear. That of her companion showed extensive bilateral infiltration.

The moral is simple. Pulmonary tuberculosis is a disease insidious in onset, and deadly in effect, yet, in its early stages it can rarely be separated without radiography from a host of harmless conditions which impersonate it with a wicked verisimilitude. Appreciation of this awkward fact must form the basis of all intelligent differentiation in diagnosis, and alone can provide the first step towards its earlier clinical recognition.

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NOTES AND QUERIES

The Efficacy of Oral Penicillin

QUERY.—What is the experimental evidence about the efficacy of oral administration of penicillin? I have never used it on the grounds that absorbtion is irregular and the small amount absorbed may cause the organisms to acquire immunity. I have, however, been working with a doctor who gives 500,000 units of crystalline penicillin twice daily, orally, to patients with acute infections such as lobar pneumonia, acute bronchitis (in infants), and cellulitis. His results appear to be as good as could be expected with parenteral penicillin, and the patients are spared the injections.

REPLY.—When the supply of penicillin was very restricted and doses were of the order of 15,000 units three-hourly, it would have been wasteful to give it by mouth as that dose does not give detectable blood levels; at least 100,000 units should be used.

The duration of effective blood levels after taking penicillin by mouth was investigated by Stewart and May (*Lancet*, 1947, **ii**, 857) in healthy adults. To obtain the most consistent results the penicillin should be given half an hour before a meal. It should be made up in about 4 oz. (114 ml.) of 5 to 10 per cent. glucose solution containing 20 grains (1.3 g.) of sodium bicarbonate or citrate. Using this method little difference can be detected between the blood levels obtained and those from the same amount given intramuscularly. Normal individuals differ in their capacity to absorb the drug but all give satisfactory levels for four hours after 250,000 units. Patients confined to bed maintain levels better than those who are ambulant. It should be remembered that it is the rate of excretion rather than anything else which determines the efficacy of penicillin, and divided doses are in consequence better than single shot techniques unless a depot is being established with procaine penicillin.

It is possible to use oral penicillin alone and get clinically satisfactory results, 250,000 units, four- to six-hourly being better than 500,000 units twelve-hourly. Alternatively, combined penicillin by injection and by mouth can be used; first an intramuscular dose, then penicillin by mouth, or an injection in the evening supported by four-hourly doses by day. Such schemes of dosage may enable blood levels to be well maintained over the whole twenty-four hours when nursing facilities prevent repeated injections. Penicillin given orally more often gives a sore mouth than when injected, but otherwise seems equally satisfactory.

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Bee Stings

QUERY.—A healthy male developed intense anaphylactic shock following a bee sting; previous bee stings had caused local reactions only, but of severe and prolonged nature. Would you advise immediate injection of adrenaline in the event of another sting, and if so, is there a preparation of adrenaline available made up in ampoules with needle attached for self-administration?

REPLY.—In the event of another sting, the following measures are recommended:—

(1) Prompt removal of the sting (which is commonly left *in situ*) by gently scraping the skin with a penknife blade or the edge of thin cardboard, and not by seizure with finger and thumb.

(2) Injection of 2 minims (0.12 ml.) of adrenaline 1:1000 into the site of the sting, and 5 minims (0.3 ml.) subcutaneously; repeat latter dose at intervals of thirty minutes as required. Ampoules of adrenaline with needle attached are not available commercially.

(3) A suitable antihistaminic by mouth.

If these measures do not succeed, and if the patient is liable to be stung repeatedly, the question of specific desensitization will have to be considered.

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Repeated Miscarriage

QUERY.—A woman aged twenty-two has conceived twice in two-and-a-half years of marriage. Each time she has aborted an ovium sac, after almost three months' amenorrhœa, with only a grossly abnormal tiny piece of undeveloped embryonic tissue inside, the size of a pea or less. She appears to be pelvically and otherwise normal. A semen report of the husband was therefore obtained (collected at laboratory):—

4.2 c.cm. volume.
88.4 million per ml.
Motility—40 per cent. after 1 hour at 37° C.
Morphology—45 per cent. abnormal types.

What treatment, if any, is likely to improve the quality of the semen? Is there serious danger in any future pregnancy of a full-term monster, or spina bifida, i.e., should a further pregnancy be encouraged or not? The husband is twenty-seven and appears quite healthy.

REPLY.—The development of an embryo depends upon the interplay between its genetic qualities and the environment in which it grows, that is, in the case of the mammal, the intra-uterine environment. The embryo in-

herits the ability to react in a certain fashion to a certain environment. Consequently, the successful development of an embryo depends partly upon its genetic qualities and partly upon a favourable environment. The intra-uterine environment is conditioned not only by the general health of the woman which, in this case, is considered to be normal, that is, there is no nephritis, syphilis, or diabetes, but also by the hormones elaborated by the corpus luteum in the first instance, and ultimately by the placenta. The activity of the corpus luteum is itself stimulated by the hormones from the trophoblast. Consequently, abundant hormones from the trophoblast mean a good corpus luteum; a lesser quantity means a less active corpus luteum. In other words, the fœtus in this respect determines its own intra-uterine environment, and after the corpus luteum has waned, about the third to fourth month of the pregnancy, and the pregnancy hormones are elaborated by the placenta, then the fœtus alone determines its continued growth. Thus the intra-uterine environment can be considered to be genetically determined.

This line of thought offers the best chance of helping the patient. Treatment of the male, in an attempt to improve the quality of the semen, by gonadotrophins, is at present not very successful, and in my experience more good can be obtained by doing everything in one's power to improve the husband's general health and to render the intra-uterine environment (endometrium) as favourable for the growth of the embryo as possible.

As already stated, both the environment and the genetic characteristics determine the successful growth of the embryo. This can best be achieved by making sure that the fertilized egg is, in the first instance, implanted in an adequately prepared endometrium, and by continuing to support the life of the embryo by the administration of hormones until the time is reached when all hormones should be elaborated by the placenta. At that time, very large quantities of hormones are required, and it would appear to be a dysgenic act to attempt to continue to maintain the life of a fœtus by the administration of synthetic hormones if the fœtus is incapable of elaborating sufficient hormones for its own survival. Consequently, the withdrawal of synthetic hormones after the 18th week helps to prevent the production of a fœtal monster at term, whilst, at the same time, the administration of the hormones in the early stages of development helps to give the embryo the greatest possible chance of normal development and survival. According to one authority the percentage of abnormal fœtuses which go to term is only 0.6 per cent.

Translated into practical terms, treatment of a patient who has suffered from repeated miscarriages is as follows :—

(1) To advise the patient to concentrate intercourse on her fertile days, calculated as occurring fifteen days (+ or —1) in advance of the anticipated onset of a period, that is, in a woman with a 28-day cycle, the 13th day (+ or —1 = the 12th, 13th, or 14th day).

(2) From the 12th day she should be given small quantities of œstrin and progestin. In practice I have found one 0.3 mg. tablet of dienœstrol and one 5 mg. tablet of ethisterone (progestin for oral administration) to be sufficient, the latter to be taken as a linguet.

(3) She should be instructed to take one each of these tablets daily until either her next period starts, or, if it does not start and she does, in fact, become pregnant, until the 18th week of pregnancy.

It may be considered that such doses are so small as to be almost homeopathic but, in practice, I have found them to be adequate because they are administered from the earliest possible moment of conception, and consequently in anticipation of nidation. I have found it quite useless to administer these hormones after it has been established that the pregnancy has begun to deteriorate, that is, after the woman has missed her period by two or three weeks and is exhibiting signs of threatening to miscarry. This is tantamount to bolting the stable after the horse has gone, because by that time the embryo will have been attempting to develop in adverse circumstances and any damage to its normal growth will have already been established. Maintenance of the pregnancy at this stage may only amount to maintenance of a maimed and malformed fœtus.

R. CHRISTIE BROWN, M.S., F.R.C.S., F.R.C.O.G.

Œstrogens and Androgens in Old Age

QUERY.—I have recently received a circular advertising a tablet containing an œstrogen and methyltestosterone. Is it safe to administer such a tablet to a man aged seventy-five to eighty years? I have two old men of this age who are married and unable to carry out their marital duties. As their wives are a bit younger this causes friction.

REPLY.—Combinations of an œstrogen with an androgen are being increasingly used in the treatment of the female climacteric. The androgenic constituent is valuable in repressing any increasing tendency to metrorrhagia which might otherwise be caused by the œstrogenic

constituent. Apart from this, many women claim that the subjective effects of the combination are better than either given alone. It is perfectly safe to administer the preparations to a man of seventy-five to eighty, but it is extremely improbable that it would do any good. There is no treatment which will have any effect in restoring potency to aged men, and this is almost certainly a good thing.

RAYMOND GREENE, D.M., M.R.C.P.

'Dromoran' and Barbiturates

QUERY.—In your issue of March, 1952 (p. 298), Prof. E. J. Wayne advocates the administration of 'dromoran' together with a barbiturate. I have had both *dl*-mephorninan and *l*-mephorninan on trial in this country for two years, supplies having been given to me by Messrs. Roche Products before they marketed the *l* form under the trade name of 'dromoran'. I believe the combination of dromoran with a barbiturate to be dangerous, and also in the American literature attention has been drawn to the inadvisability of combining the two compounds. Dromoran is a first-class analgesic, especially in the management of the patient with chronic and severe incurable pain. Its prolonged action, and the fact that it is effective by mouth, are great advantages. If it is desired to produce sleep, rather than alleviate pain, is it not better therefore to prescribe some other substance?

REPLY.—I can find only one published reference to the inadvisability of administering *l*-mephorninan ('dromoran') with barbiturates. Stoelting, Theye, and Graf (*Anesthesiology*, 1951, **12**, 225) mention that out of 1,500 patients to whom this substance had been given preoperatively, 20 experienced marked respiratory depression. Four of these had received a barbiturate in addition to 'dromoran', and the authors consider that 'the barbiturate played an important rôle in the depression'. The respiratory depression in eight cases is attributed to 'an unexpected pharmacologic action of the drug alone'. It is not known whether barbiturates potentiate the effect of 'dromoran' on the respiratory centre, and observations on animals would be necessary to decide the point.

Your reader does not describe the nature of the dangerous effects he has himself observed, nor does he mention the number of cases in which they occurred. If respiratory depression was among them, it would be of interest to know the doses of 'dromoran' and of barbiturate used. It is clear that the combination of a barbiturate and 'dromoran' should be used, if at all, with the very greatest caution, and methods of combating respiratory depression should be at hand. On the information at present available it is better, as your reader suggests, to use some other substance if it is desired to produce sleep as well as to relieve pain.

PROFESSOR E. J. WAYNE, M.D., F.R.C.P.

PRACTICAL NOTES

Bromethol in Eclampsia

'A SERIES of 36 cases of eclampsia, in which the convulsions were controlled by avertin (bromethol, B.P.) is reviewed' by A. U. Campbell and H. Burton (*Journal of Obstetrics and Gynæcology of the British Empire*, February, 1952, **59**, 30). The dosage was 'the dosage of avertin midway between the obstetric twilight sleep and basal anæsthetic dosage'. In the case of the average woman, estimated as weighing 10 stones (63 kg.), this means 5.5 ml. of a 2.5 per cent. solution, given rectally—'a dosage that was seldom exceeded, even in heavier women'. A freshly prepared solution was taken by the flying squad, as it is important that the first dose should be given before the woman is moved by ambulance to hospital. This dosage can be repeated after three hours if the patient's condition justifies it. A nurse remains in constant attendance until bromethol is discontinued. 'In the nursing care it is unnecessary to avoid bright lights and noise, and, in fact, all treatment can be carried out without fear of stimulating fits'. Other measures used included intermittent intravenous hypertonic dextrose, and 10 ml. of 10 per cent. calcium gluconate intravenously every day. The conscious patient was encouraged to drink up to 750 ml. of fluid daily. In addition, 220 ml. of water was given with each rectal instillation of bromethol. All the cases of eclampsia admitted to the hospital since December 1947 (i.e., 36) were treated in this way. There were no maternal deaths and the fœtal mortality rate was 28.95 per cent. The comparable figures for the previous 36 cases in the same hospital, treated by 'a modified Stroganoff method' were a maternal mortality rate of 16.66 per cent. and a fœtal mortality rate of 39 per cent. In the bromethol-treated series, all nine multigravidæ with antepartum or intrapartum eclampsia had normal deliveries, but of the 19 primigravidæ with antepartum or intrapartum eclampsia, 3 had normal deliveries, 3 were assisted breech deliveries, 8 were low-forceps extractions, 1 a mid-forceps extraction, and 4 were delivered by Cæsarean section.

Mercurial Diuretics and Bromide Intoxication

As a result of their experience with three cases, A. E. Hussar and H. J. Holley (*American Journal of the Medical Sciences*, March 1952, **223**, 262), suggest that 'the most effective therapy of bromide intoxication is the combined administration of ammonium chloride or sodium chloride and mercurial diuretics'. The first patient, whose blood bromide was 284 mg. per 100 ml., was given 6 g. of sodium chloride daily added to the diet, and 2 ml. of an organic mercurial diuretic intramuscularly on the third, sixth, ninth and twelfth days. The second patient, whose blood bromide was 250 mg. per 100 ml., was given the same amount of sodium chloride, and 2 ml. of the organic mercurial diuretic intramuscularly on the fourth, seventh, and tenth days. The third patient, whose blood bromide was 100 mg. per 100 ml., was given 1 g. of ammonium chloride four times daily, and 2 ml. of the organic mercurial diuretic intramuscularly on the third and sixth days. In all three cases there was a satisfactory response. 'There were no findings indicating an exacerbation of symptoms from quick mobilization of bromides after treatment with the mercurial drug'.

Age and the Serum Iron in Health

SERUM iron levels in normal individuals aged ten to eighty years have been studied by R. Pirrie (*Journal of Clinical Pathology*, February 1952, **5**, 10). The mean results are shown in the following table:—

Age (years)	Males		Females	
	No. of Subjects	Mean μg.%	No. of Subjects	Mean μg.%
10-15	4	97	5	92
16-20	5	129	7	116
21-30	18	132	15	116
31-40	26	115	12	100
41-50	19	96	19	89
51-60	16	90	21	76
61-70	10	84	12	75
71-80	10	75	7	66
10-80	108	103	98	91

The difference between the sexes is statistically significant. At puberty the serum iron increases with age in both sexes, but the rise is greater in males. Sex differentiation is maximal during the reproductive period, but there is no tendency for the serum iron to increase after the menopause. In both sexes, after the age of thirty there is a progressive fall in iron concentration in the serum with progressive increase in age. The cause of this decrease in serum iron with age is still obscure. 'Iron may be less efficiently absorbed by older people . . . Perhaps the general decrease in metabolic activity associated with ageing may be the explanation, in that the demand for the iron-containing respiratory enzymes will be correspondingly diminished'.

Methylcellulose and Psyllium as Bulk Laxatives

Two reports on the efficacy of methylcellulose and of psyllium as bulk laxatives have recently been published. In one, D. A. Berberian *et al.* (*Gastroenterology*, January 1952, **20**, 143) compare the effects of (a) tablets containing 0.5 g. of methylcellulose, and (b) tablets containing 0.4 g. of methylcellulose and 0.1 g. of purified psyllium hemicellulose. They used eight volunteers for their investigation, and based the efficacy of the tablets on the stool-weight method. When nine methylcellulose tablets were given daily the bulk of the stools was increased by 26.8 g. daily (an average of 2.98 g. per tablet). The corresponding figures for the compound tablets were 20.8 g. daily when six tablets were given daily (an average of 4.7 g. per tablet), and 50.2 g. when nine tablets were given (an average of 5.58 g. per tablet, or 87 per cent. more than with the methylcellulose tablets). In the case of the average daily water content of the stools, this was not increased by methylcellulose, but was increased by 1.84 per cent. when nine of the compound tablets were given. The compound tablet also acted more quickly than the methylcellulose ; with the latter there was a moderate constipating effect on the first day, whereas the former acted immediately. It is concluded that 'it is apparent that the compound tablet combination works more promptly, and induces a greater effect per given dose. Therefore, addition of psyllium to the methylcellulose provides a combination with enhanced therapeutic value'. The second report, by L. J. Cass and L. P. Wolf (*Ibid.*, p. 149), compares the efficacy of methylcellulose (ten to twelve 0.5-gramme tablets daily) and pure psyllium seed coat (one teaspoonful [6.5 g.] twice daily). The latter was given either as a fine powder by itself, or mixed with an equal amount of lactose or dextrose to provide suspension in water; this suspension is 'esthetically more attractive than the psyllium seed coat'. The investigation was carried out on 'hospitalized elderly males and females with chronic diseases, bedridden or partially ambulatory, many of whom had extreme bowel difficulties'. They found that 'psyllium seed preparations proved considerably more effective than methylcellulose as a bulk laxative, and were also superior to previous

laxatives such as milk of magnesia, mineral oil, cascara'. For instance, in a group of 23 patients with arteriosclerotic heart disease, 77.5 per cent. were 'improved with psyllium, compared with only 33.3 per cent. among those receiving methylcellulose.

Elastic Stockings and the Prevention of Pulmonary Embolism

As pulmonary embolism usually results from 'clinically silent phlebothrombosis in the deep veins of the leg', R. W. Wilkins *et al.* (*New England Journal of Medicine*, March 6, 1952, **246**, 360) investigated the possibility of preventing the onset of pulmonary embolism by the wearing of elastic stockings. Alternate patients over the age of twenty years were the subject of the investigation, excluding those with peripheral cardiac œdema (as one such patient developed pulmonary œdema soon after the application of elastic stockings), and patients with arterial insufficiency and/or local ulceration or inflammatory lesion of the legs. There were 2,346 patients in the series who wore elastic stockings, and 2,395 in the control group (who wore non-elastic stockinette). The results are shown in the following table:—

Diagnosis	Stocking Group	Control Group
Fatal pulmonary embolism	0	4
Non-fatal pulmonary embolism	2	12
Definite or probable thrombotic disease without pulmonary embolism	16	11
Possible thrombotic disease without pulmonary embolism	20	18

There was a relatively high incidence of fatal and non-fatal embolism in the patients excluded from the investigation on account of peripheral cardiac œdema. In view of this, it is not now considered necessary to consider peripheral cardiac œdema as a contraindication provided the pressure applied by the elastic stocking does not exceed 10 to 15 mm. Hg, and provided particular care is taken in patients with gross œdema of the legs. As a result of their experience in this preliminary study, the authors recommend the use of knee-length elastic stockings, which must be applied smoothly, and providing a pressure of 10 to 15 mm. Hg. Ischæmic vascular disease in the legs is considered an absolute contraindication to the use of elastic stockings. 'For practical purposes it was found that the best rule was to refrain from applying elastic stockings to any patient with impalpable dorsalis-pedis pulsations'.

Hyaluronidase in the Treatment of Urinary Calculi

According to A. J. Butt and E. A. Hauser (*Science*, March 21, 1952, **115**, 308), 'hyaluronidase therapy has been effective in preventing the formation or recurrence of urinary calculi over a period of 11-15 months in 18 of 20 patients with a tendency to rapid stone formation'. It is stated that evidence was obtained that 'the urine of individuals giving evidence of stone formation was deficient in protective colloids, and that this was the main factor in stone formation'. Among the patients studied the incidence of stones was inversely proportional to the protective colloids present. 'Subcutaneous injection of hyaluronidase (mixed with saline) causes a pronounced increase in protective urinary colloids. The colloids may form a gel and thereby prevent crystallization of the electrolytes present. They act as excellent dispersing agents, preventing the formation of stones'.

The Toxicity of Emetine

The incidence of toxic effects with emetine has been studied in 111 adult patients, aged eighteen to seventy-two years, by W. A. Sodeman *et al.* (*Transactions of the Royal Society of Tropical Medicine and Hygiene*, March 1952, **46**, 151). Symptomatic intoxication appeared in five patients—an incidence of 4.5 per cent. Three of these patients were females, and this represents 60 per cent. of the female patients in the series. There was no correlation between age and incidence of intoxication—the ages of the five patients were thirty-five, thirty-five, forty-two, nineteen and twenty-four years. In three of the patients the predominant toxic manifestations were muscular weakness and neuritis; the other two had involvement of the cardiovascular system: tachycardia and hypotension in one, and tachycardia, vertigo and syncope in the other. None of the patients with neuritic signs showed electrocardiographic evidence of myocardial damage. Electrocardiograms were recorded in 38 of the patients, and 10 (26.4 per cent.) of these showed changes 'definitely indicative of a cardiac effect of the drug'. These consisted of T-wave changes in all ten, prolongation of the P-R interval in two, and deformity of QRS in three. The dose/weight ratio at which symptoms appeared was 1.3, 10.2, 13.2, 13.5, and 11.0 mg. per kg. of body weight. If the first patient, who was obviously very sensitive to emetine, is excluded, 'the other ratios indicate clearly that, when the arbitrary rule of 10 daily 1-grain doses gave a dose/weight ratio exceeding 10 mg./kg., symptomatic intoxication occurred'. Attention is

drawn to the fact that in this series the electrocardiograph proved a more sensitive guide to intoxication than the onset of symptoms, but 'the usual electrocardiographic changes were not an indication to stop therapy'. It is concluded that 'although emetine is a potent and dangerous drug, when patients are carefully watched—as they are when taking digitalis and other potent drugs—evidences of intoxication can be kept to a minimum and serious results of intoxication can be controlled'.

Anticoagulants as Antirheumatics

THE results obtained with anticoagulants in 13 cases of rheumatic disease are recorded by G. W. Howe *et al.* (*American Journal of the Medical Sciences*, March 1952, **223**, 258). The preparations they used were 'heparin depository' a delayed-action heparin, and 'paritol-C' which is 'a polysulfuric acid ester of polyanhydromannuronic acid'. Dosage was 200 to 300 mg. of heparin subcutaneously every twelve hours, whilst paritol-C was given intravenously, 3 to 4 mg. per kg. body weight in 5 or 10 per cent. solution every twelve to twenty-four hours. 'Complete remission of all clinical signs and symptoms occurred in the 5 cases of gout'. Five of the six patients with rheumatoid arthritis 'reported subjective improvement', whilst four 'showed objective improvement in 40 to 96 hours, manifested by a decrease in swelling of actively involved joints'. 'Complete remission of pain and swelling in 5 days' occurred in the one case of 'undiagnosed polyarthritis' and 'complete remission of symptoms and signs in 48 hours' in the one case of 'undiagnosed monoarthritis with pericarditis'. The authors 'do not propose that either of these drugs is an effective therapeutic agent in cases of rheumatoid arthritis' but suggest that they have 'definite antirheumatic activity' and that 'related substances may be developed which will exhibit greater antirheumatic action'.

Chloramphenicol in Rosacea

A REPORT of the results obtained in 200 cases of rosacea is given by R. Aron-Brunetière, J. Bourgeois-Gavardin, and I. Kohen (*Presse Médicale*, March 26, 1952, **60**, 424). The dosage of chloramphenicol used was a total dose of 6 g. for a period of eight days, 1 g. being given on the first two days, 0.75 g. on the four days following, and then 0.5 g. for the two remaining days. This dosage scheme proved adequate in most cases, but in some the treatment was prolonged for four to six days, and in 43 cases in the series in which this latter method was adopted cure was obtained by one or two four-day periods of treatment with 0.75 g. chloramphenicol daily. In the treated series, complete cure or marked improvement was obtained in 48.4 per cent., improvement in 19 per cent., and poor results or failure in 32.6 per cent. In some cases in which chloramphenicol therapy had resulted in incomplete cure or even in failure, aureomycin, given in the same dosage scheme, was effective in clearing the condition. In conclusion it is stated that 'chloramphenicol in limited dosage is an effective measure for the treatment of these affections, so often resistant and distressing, such as rosacea of the face and recurrent folliculitis of the face and body. It does not exclude the possibility of recurrences. It is particularly justified in severe cases of such affections'.

Absorption of Nicotine in Smoking

USING a method which is claimed to be more reliable than previously used methods, L. A. Greenberg *et al.* (*Journal of Pharmacology and Experimental Therapeutics*, February 1952, **104**, 162) have reinvestigated the problem of how much nicotine is absorbed during tobacco smoking. Cigarettes and cigars of well-known commercial brands were used for the investigation, and it was found that the average nicotine content was 17.2 mg. per g. of dry tobacco for cigarettes, and 17.4 mg. per g. of dry tobacco for cigars. The average nicotine content of the smoke was: in the case of dry cigarettes, 4.2 mg.; moist cigarettes, 2.5 mg.; dry cigars, 4.35 mg.; moist cigars, 2.35 mg. Expressed as a percentage of the nicotine in the tobacco burned, these figures correspond to percentages of 35, 21, 37, and 19 respectively. Attention is drawn to two features of these findings: (a) only a portion of the nicotine present in the tobacco appears in the main stream smoke; (b) the smoke from dry cigarettes and cigars contained 70 to 90 per cent. more nicotine than that from moist cigarettes and cigars. The moisture content used in this investigation (11 per cent.) 'corresponds to a relative humidity of 65 per cent., the humidity long recognized as the ideal condition for keeping tobacco products. The maintenance of a proper moisture content in cigars and cigarettes has, therefore, more than esthetic value, since the smoke of a dry product makes almost twice the amount of nicotine available for absorption in the process of smoking'. The amount of nicotine retained in the body ranged from 4 to 45 per cent. with non-inhalation; with inhalation the figure was 96 to 98 per cent. It is pointed out that 'since inhaling is very common among cigarette smokers and rare among cigar smokers, it is likely that the former absorb considerably more nicotine than the latter'.

REVIEWS OF BOOKS

Modern Trends in Gastro-enterology. EDITED BY F. AVERY JONES, M.D., F.R.C.P. London: Butterworth & Co. (Publishers) Ltd., 1952. Pp. xii and 831. Figures 275. Price £5 5s.

THERE has for long been a need for a textbook of gastro-enterology in this country, and Dr. Avery Jones and his collaborators have amply met this need. The authors are practically all drawn from Great Britain, but the excellent chapters on gastric biopsy, bacillary dysentery, and liver biopsy and liver function tests are from the Melbourne School of Medicine. The thirty-four chapters cover the whole field of gastro-enterology with an almost traditionally teutonic thoroughness. The opening chapter, for instance, is entitled 'anæmias of the alimentary tract'. In this most informative, if slightly misnamed, chapter, Professor Witts has obviously had some difficulty in interpreting his brief; probably 'the alimentary tract in anæmia' would have been a more accurate description. Two of the most impressive features of the work are the attention given to general principles and the happy association between physicians and surgeons. There is, for instance, an admirable chapter on 'the physiology of fat absorption', by A. C. Frazer, whilst T. D. Kellock provides an authoritative review of 'fluids and electrolytes in gastro-enterology'. Surgeons are responsible for the chapters on diaphragmatic hernia, cardiospasm, portal hypertension, and carcinoma of the pancreas, among others, and a physician and surgeon are joint-authors of the chapter on 'ulcerative colitis'. Where all attain such a high standard, it is perhaps invidious to select, but particular mention should be made of W. I. Card's section on the etiology of peptic ulcer, and H. T. Howat's chapter on pancreatitis. The former is a model of conciseness and judicial summing-up, whilst the latter contains the best review of pancreatic function and its investigation that has been published in this country. Although theory and scientific background are given due attention, the book is predominantly clinical and practical in its outlook, and is one which every clinician will find of the utmost value.

Lung Abscess. BY R. C. BROCK, M.S., F.R.C.S. Oxford: Blackwell Scientific Publications, 1952. Pp. vi and 197. Figures 60. Price 35s.

UNTIL the publication of this work the literature on lung abscess has been diffuse and confusing, and there were widely divergent schools of thought concerning the methods of treatment. Since the introduction of penicillin the character of pulmonary infection has changed considerably, and with it lung abscess: the appalling fœtid abscesses seen in former years have diminished considerably in incidence and severity. Nevertheless, the condition still persists as a problem of considerable magnitude, and Mr. Brock's writings on this subject have done much to clarify the etiological factors and pathological anatomy.

The main thesis in the work is that 'lung abscess is almost always secondary to something else'. The recognition of the primary cause may not be easy, but in certain instances, such as in staphylococcal and *B. Friedländer* infections, a well-defined clinical picture can be made out. The two initial chapters on bronchopulmonary segmental anatomy in pathology are most instructive in demonstrating the course that infective material may take in the bronchial tree. The section on treatment occupies forty pages and emphasis is laid on the importance of active surgery in a number of cases. Undoubtedly this was very necessary in the era before penicillin, but there has been a considerable improvement in the results since massive penicillin therapy has been added to the already recognized expectant measures. Some authorities feel that operative surgery in the acute stages is unnecessary, and only if chronic changes persist will excision be called for. Mr. Brock gives in detail his indications for external drainage and early lobectomy or pneumonectomy, but the figures and results given cover a period which partly precedes the introduction of penicillin and other antibiotic agents. The reader is left somewhat uncertain as to the present practice in treatment. Expectant treatment, including chemotherapy, is clearly the initial step, but in what proportion of cases does this fail, and if it fails will urgent excision always be necessary?

The production is admirable, and in addition to the numerous illustrations the analysed results of 477 cases are recorded to make this monograph a valuable contribution to this branch of pulmonary disorder.

Textbook of Refraction. By EDWIN FORBES TAIT, M.D., PH.D. Philadelphia and London: W. B. Saunders Company, 1951. Pp. ix and 418. Figures 93. Price 40s.

THE subject-matter of this book falls into five sections. The first is introductory and briefly discusses the factors concerned in good vision. The next section deals with anomalies of accom-

modation, hypermetropia, myopia, astigmatism, presbyopia, aphakia, isometropia and aniseikonia. The author's views on the symptoms and treatment of these conditions agree with British practice except, possibly, in his liking for bifocals for young myopes. The section on muscle anomalies is introduced by chapters on terminology, the anatomy and physiology of the ocular muscles and the reflexes which take part in the ocular vergence and in binocular fusion. Particular attention is paid to muscle anomalies at the near point and the importance of 'reserve fusional vergence' in relation to the type and degree of heterophoria. This chapter is the most interesting but takes some digesting. The fourth section is on methods—history taking, general examination, keratometry, static and dynamic skiametry, and orthoptics. Lastly, the whole is summarized in a scheme outlining a complete systematic method of examination and its interpretation.

The general arrangement is such that the argument is not at first sight as clear as it might be and there is a considerable amount of repetition; the somewhat cumbrous definitions, the multiplicity of classification and what appears to be an over-elaboration of method, give the subject an awe-inspiring but possibly unwarranted air of complexity. There are also too few diagrams to illustrate the text. These possible drawbacks, however, are far outweighed by the unquestionable interest and value of the book. The omission of much elementary detail has allowed room for a philosophical approach to the subject which is unusual and which gives the book its chief interest. It is, however, essentially practical in its advice on the treatment of the various anomalies, and there are many useful suggestions on less obvious points. The book is clearly the product of great experience, much thought lies behind every sentence, and every observation and recommendation is given at first-hand. It is likely to be of particular value to the practising ophthalmologist and refractionist.

Differentialdiagnose innerer Krankheiten. By Dr. Robert Hegglin. Stuttgart: Georg Thieme Verlag, 1952. Pp. xvi and 456. Figures 220, some in colour. Price DM 49.80.

Into this compact book of some 400 pages, the author has essayed to compress a system of differential diagnosis, dealing not only with the clinical features of individual pathological conditions, but also with the investigation of such cases with all the resources of the modern medical armamentarium. Naturally, clinical descriptions have had to be compressed and the main accent is on the laboratory and radiological investigation of cases. The author in his preface states that it was his intention to deal with the differential diagnostic problems of these symptoms most commonly encountered, and more from the standpoint of the physician at the bedside than from the point of view of the specialist. In general the views and methods expressed are thoroughly up to date. The section on cardiac disease, for example, includes multiple lead E.C.G.s and cardiac catheterization. Some passages, however, strike one as hardly in keeping with current British teaching; for example, the emphasis on wasting in Simmonds' disease (p. 202); the statement that pure pulmonary stenosis is very rare (p. 160); the description of lipoid nephrosis as an entity (p. 388); and the emphasis in the description of sprue (pp. 44 and 365) on the bulky, fatty stools and the results of stool analysis on a single specimen. These are, however, minor defects in an otherwise admirable production which can be recommended to the general reader as a carefully compiled epitome of all that is best in present diagnostic methods.

Portrait of a Surgeon: A Biography of John Hunter. By Ernest A. Gray. London: Robert Hale Ltd., 1952. Pp. x and 219. Illustrated. Price 16*s*.

The Life and Work of Astley Cooper. By R. C. Brock, M.S., F.R.C.S., F.A.C.S. Edinburgh: E. & S. Livingstone Ltd., 1952. Pp. viii and 176. Plates 14 and frontispiece. Price 20*s*.

It is remarkable that two men so different as Hunter and Astley Cooper should yet have had so much in common. Hunter was a raw farm lad, whose lack of schooling was compensated by a keen intellect and a restless curiosity; and whose uncouth manners were made up for by a natural kindliness. Astley Cooper was one of the most handsome men of his day, and his good looks, fashionable dress, courtly manners and easy address gave him the entry to the highest circles. Hunter was an indifferent operator and a remarkably poor teacher, finding difficulty in putting into words the ideas that thronged his brain. Astley Cooper was a brilliant operator and as a teacher probably the most successful of any time and any country. Hunter, quarrelsome and barely intelligible, was worshipped by a few followers, but undervalued by his contemporaries in general. Astley Cooper was loved and admired, even idolized by all who saw his work or came under his spell to an extent that has led later generations to lose sight of his integrity, his tireless industry, and his unique contributions to the science and art of surgery. Both men worked long hours

that no modern man could tolerate, rising at four to dissect until eight after working until midnight the day before. Both spent every minute snatched from practice in research and the preparation of specimens, and had few interests and no diversions outside their work. Both had a love of their fellows that knew no distinction of class or wealth. Both died in harness.

Ernest Gray's book is written for laymen. The surgical reader may find the first chapter on the early years of John Hunter, with its purely conjectural narrative, its journalistic flourishes and its abundant clichés somewhat irritating. Having survived, or skipped, this obstacle, he will be charmed with the rest of the book. Mr. Gray has managed to give a living picture of the dirty, noisy, quarrelsome London which formed the background to the work of the Hunter brothers, and a sympathetic character study of the brothers themselves. He has read widely, and presents a narrative of Hunter's scientific work that is remarkably full and accurate; indeed, the reader is presented with information more complete than he could otherwise obtain without much labour and research.

Mr. Brock's book is of a different order; a careful re-assessment of the life and work of the greatest of all Guy's men. Astley Cooper, more than any man, was responsible for converting Hunter's ideals into a living faith. He towered so far above his contemporaries, as an investigator, as a thinker, as an operator and as a public figure, that he raised Guy's from an annexe of St. Thomas's Hospital to the leading medical school of the time. His fame was so great and his popularity so universal while he lived that his reputation suffered a quite unjustifiable eclipse after his death. Brock's appreciation is timely, and well deserved, and the scholarly style in which he writes lends further distinction to a notable biography.

NEW EDITIONS

Recent Advances in Medicine, by G. E. Beaumont, D.M., F.R.C.P., and E. C. Dodds, M.V.O., M.D., D.SC., PH.D., F.R.C.P., F.R.I.C., F.R.S., in its thirteenth edition (J. & A. Churchill, 27*s.* 6*d.*) contains three new chapters: on 'the collagen diseases', 'the antihistamines', and 'the use of isotopes in medicine'. The chapter on antibiotics has been extended to include sections on aureomycin, chloramphenicol, streptomycin and terramycin, and new sections on vitamin B_{12}, radioactive iodine, B.C.G. vaccination, combined streptomycin and PAS therapy in tuberculosis, cardiac catheterization, and liver function tests have been added. These are but a few of the additions to the new edition, which contains a wealth of information on advances in medicine since the publication of the twelfth edition in 1947.

Textbook of Surgical Treatment (including operative surgery), edited by C. F. W. Illingworth, C.B.E., M.D., CH.M., F.R.C.S.ED., F.R.F.P.S., (E. & S. Livingstone Ltd., 45*s.*) has reached a fourth edition in ten years, which is good evidence that its fundamental conception has found favour. It is a textbook designed primarily for the surgical trainee, and aims at giving a detailed description of the treatment of the commoner surgical conditions combined with a more general review of advanced techniques. The editor has brought together a strong team of Scottish surgeons, almost all emanating from the surgical schools of Edinburgh and Glasgow, and has also well fulfilled his editorial function in achieving a good balance of presentation. He himself sets a good example in contributing an excellent opening chapter on preoperative and postoperative care. Naturally there are points for individual criticism. Thus, in lumps of the breast the author reflects the apparent reluctance of Scottish pathologists to employ fully rapid methods of microscopical examination, such as frozen section, and relies more on naked-eye appearances. But the overriding impression that the book leaves with the reviewer is that the editor and contributors have admirably fulfilled the task they set themselves. The book has been produced in the excellent manner that we have now come to associate as a routine with the publishers.

Practical Procedures, edited by Sir Heneage Ogilvie, K.B.E., D.M., M.CH., F.R.C.S., and William A. R. Thomson, M.D., in its second edition ("The Practitioner' Handbooks: Eyre & Spottiswoode (Publishers) Ltd., 25*s.*). This well-known handbook, first published in 1938, has been enlarged and brought up to date, in its second edition. Its usefulness in the past has depended entirely upon its strictly practical nature, and it is clear that this essential has been kept in the forefront of the minds of the contributors and editors during its recent revision. Many of the well-tested sections, such as that on transfusions, have been much expanded. Another example of revision is found in the section on blood counts in which the interpretation of such things as M.C.V. and M.C.H.C. values that have been relatively recently introduced into routine hæmatological investigation are discussed. The ten new chapters number among them such diverse subjects as penicillin and streptomycin therapy, hormone implantation, the technique of biopsy, practical procedures in ophthalmology, and one on rectal

examination that is particularly good and should be read by every medical student, qualified or otherwise. This catholic collection of new chapters expands rather than alters the pattern set in the first edition. Study of this book will reward candidates for both qualifying and higher examinations, and it will be referred to repeatedly by practitioners. This is a book for every doctor.

J.S.R.

A Course in Practical Therapeutics, edited by M. E. Rehfuss, M.D., F.A.C.P., and Alison Howe Price, A.B., M.D., in its second edition (Baillière, Tindall and Cox, 114s.) provides a comprehensive account of practical therapeutics, based on the visual system, which is so popular in America, but tends to be unjustly decried in this country. This system will undoubtedly prove useful for quick reference, both by practitioners and consultants; the authors are to be complimented on their clear, planned approach to the problem of therapeutics, and also on their care to emphasize the importance of prescription writing. It is impossible to mention each section individually in a book of this size, but it is refreshing to see subjects such as atomic warfare, occupational therapy and psychotherapy incorporated, and also to find such a practical account of pre- and post-operative treatment in a number of common disorders. The illustrations are plentiful and for the most part clear; in particular the charts in the sections on symptomatic treatment afford a convenient visual reminder both of differential diagnosis and diagnostic tests as well as a tabulated list of therapeutic measures. There is a particularly good section on cardiovascular disease, but it is perhaps confusing to include such congenital abnormalities as Fallot's tetralogy, which are hardly of therapeutic interest. Many physicians will be perturbed by the recommendation to use dicoumarol in general practice even in the absence of laboratory check; tromexan is not even mentioned. It is disappointing that the sections on psychotherapy and dermatology fall short of the generally high standard shown in other sections. Although the book must inevitably have a limited appeal in this country, once the difficulty of the U.S. pharmacopœia nomenclature has been overcome, it will be found a most valuable reference book.

Tuberculosis of Bone and Joint, by the late G. R. Girdlestone, D.M., F.R.C.S., and E. W. Somerville, F.R.C.S.Ed. (Oxford University Press, £2 5s.). Girdlestone did not live to see the second edition of the book that was so near to his heart, but it is fortunate for the world that he had recruited Mr. E. W. Somerville as co-author and was able to complete its preparation before he died. Those who are familiar with the first edition will welcome the appearance of the second, which offers them the experience of a long life given to the treatment of tuberculosis. It has been written, as the authors point out, at a time when treatment is at the cross-roads. Chemotherapy has been introduced too recently for its value to be fully assessed, but a timely warning is given that, at the best, it can do no more than supplement the old methods. This book is an account of the old methods—they are still the best methods—and even though we may be on the threshhold of great discoveries, the principles of treatment will not change. The uncertainties and dangers of this indeterminate disease must remain, and all who would try new methods must be familiar both with the habits of the disease and with the old methods of treatment on which the new will be grafted.

Approved Laboratory Technic, by John A. Kolmer, M.D., Sc.D., F.A.C.P., D.P.H., Earle H. Spaulding, Ph.D., and Howard W. Robinson, Ph.D., in its fifth edition (H. K. Lewis & Co. Ltd., 90s.), is edited by a physician, a bacteriologist and a biochemist and there are eighteen collaborators. Stress is laid by the authors on the need for accurate methods of analysis, and they ask laboratory technicians to conduct tests exactly as described in their textbook. Unless this is done discrepancies will arise in reports by different laboratories. Attention is also drawn to the futility of analysing improperly collected and preserved specimens. Examination of these specimens should be refused. The book is divided into seven parts with details of methods on general pathology (microscopy, care and diseases of animals), clinical pathology (blood, urine, sputum, fæces, and the like), bacteriology and mycology, parasitology, serology, chemistry and histopathology. The illustrations and colour plates are very good. This textbook will serve as an excellent reference work, and is of value to physicians, clinical pathologists, medical students and technicians alike.

INDEX AND BINDING CASES

The index to Vol. 168 (January-June, 1952) will be forwarded to all subscribers with the July 1952 issue. Binding cases for this and previous volumes are available in green cloth with gilt lettering, price 5s. each, post free. The cases are made to hold 6 copies after the advertisement pages have been removed; they are not self-binding. Alternatively, subscribers' copies can be bound at an inclusive charge of 12s. 6d. per volume; this includes the cost of the binding case and return postage.

The contents of the the July 1952 issue, which will contain a symposium on 'Cardiovascular Disease,' will be found on page lxxi at the end of the advertisement section.

Notes and Preparations, see page 647
Fifty Years Ago, see page 651

The Roche research chemists, following several years of intensive study, discovered that isonicotinyl hydrazine, 'RIMIFON,' is effective against tuberculosis.

Clinical trials are being continued.

In view of the urgent need for wider confirmation of this early work, 'RIMIFON' has been made available to all hospitals and tuberculosis centres.

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HAY FEVER

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9/1

NOTES AND PREPARATIONS

NEW PREPARATIONS

Isonicotinic Acid and its Isomers

The following information concerning various preparations of isonicotinic acid hydrazide and its isomers has been supplied by the manufacturers, from whom further details can be obtained.

'MYBASAN', which is isonicotinic acid hydrazide, is supplied in tablet form, each tablet containing 50 mg. (Antigen Laboratories Ltd., 95 Great Portland Street, London, W.1.)

'NICETAL' is an isonicotinic acid isomer which, 'pending its general release to the medical profession will shortly be made available for controlled clinical trials in recognized sanatoria and hospitals'. (A. Wander Limited, 42 Upper Grosvenor Street, London, W.1.)

'NYDRAZID' is isonicotinic acid hydrazide. Initial supplies have been supplied through the Ministry of Health, to the Medical Research Council for clinical trial. Supplies will be made available to the medical profession 'as soon as the early therapeutic expectations of the drug have been confirmed. It will then be made available to sanatoria and hospitals where the greatest need exists'. (E. R. Squibb & Sons, 17-18 Old Bond Street, London, W.1.)

'RIMIFON' is isonicotinyl hydrazide and is issued as tablets of 50 mg. It also is undergoing clinical trial under the ægis of the Medical Research Council, and the manufacturers inform us that in view of the 'widespread publicity which the drug has been accorded in the non-medical press and the overwhelming interest which it has evinced amongst the medical profession' they 'do not feel justified in withholding "Rimifon" from doctors who are anxious to try the drug in spite of the incompleteness of the data available'. (Roche Products Limited, Welwyn Garden City, Herts.)

'TUBOMEL' is isonicotinyl hydrazide and is issued as 50 mg. tablets, in containers of 100 and 1000. (Benger Laboratories Limited, Holmes Chapel, Cheshire.)

'CHOLINVEL—THE V.L. CHOLINE SYRUP' is a liquid preparation of choline dihydrogen citrate, with the same therapeutic action but without the disagreeable flavour of choline chloride. Its use is indicated 'in conditions associated with disordered hepatic function, including fatty liver and cirrhosis'. It is issued in the form of a 10 per cent. solution for oral administration. (Vitamins Ltd., Upper Mall, London, W.6.)

'STREPTOMYCIN DC(B)L' and 'DIHYDROSTREPTOMYCIN DC(B)L' are now available in vials of 5 mega units (the equivalent of 5 grammes of pure base), in addition to the vial of 1 mega unit. (The Distillers Company (Biochemicals) Ltd., Fleming Road, Speke, Liverpool, 19.)

'SULPENIN' is a combined penicillin and sulphonamide product, each tablet containing penicillin, 100,000 units; sulphadiazine, 0.25 g.; and sulphamerazine, 0.25 g. Indications for the use of 'sulpenin' include: infections due to organisms susceptible to penicillin and the sulphonamides, staphylococcal, pneumococcal and gonococcal infections, and mixed infections of the urinary tract, respiratory system and gastro-intestinal tract. Issued in tubes of 10, and bottles of 100 tablets. (Allen & Hanburys Ltd., Bethnal Green, London, E.2.)

'VERILOID INTRAVENOUS SOLUTION' and 'VERILOID-VP (Veriloid with phenobarbitone) TABLETS'.—'Veriloid intravenous solution' is a standardized hypotensive extract of veratrum veride prepared for intravenous administration, and supplied in ampoules of 5 and 20 ml., each ml. representing 0.4 mg. of 'veriloid standard reference powder', in 0.25 per cent. acetic acid. Its use is indicated in the treatment of hypertensive states, such as those accompanying cerebral vascular disease, in malignant hypertension, encephalopathy, and in hypertensive states after coronary occlusion. 'Veriloid-VP' has been prepared for use in the treatment of hypertension by oral administration. It is issued in scored tablets, each tablet containing 2 mg. of veriloid brand of veratrum viride alkaloids together with 15 mg. (approx. ¼ gr.) of phenobarbitone, in bottles of 100 and 500 tablets. (Riker Laboratories Ltd., 29 Kirkewhite Street, Nottingham.)

'7UP' is a carbonated drink containing sugar cane, lactic acid, citric acid, sodium citrate, and refined lemon and lime oils. It has a fresh, clean taste and can be used chilled with different fruit sherbets, with milk, with fruit juices as an apertif, in the preparation of punch, ice cream sodas, and for many other purposes. (Seven-Up Bottling Co. (London) Ltd., 120 Chiswick Lane, London, W.4.)

NEW APPARATUS

The 'AMPLION "HB" ACTIVETTE' has been designed to reduce the heavy cost of hearing aid batteries. It is claimed that 5s. is saved out of every 6s. by the use of regenerating dry batteries with the 'Activette'. The H.T. voltages are adjusted by means of a 3-way voltage selector at the rear of the instrument, and all types of

CONTINUED ON PAGE 648

hearing aid batteries can be reactivated. With the aid of the Amplion Activette, which has a consumption of approximately 3-watts or over 300 hours for one electricity unit, it is claimed that the life of a dry battery can be extended up to six times. (Amplion (1932) Ltd., 230 Tottenham Court Road, London, W.1.)

The 'DUNLOPILLO "super comfort" pillow' is made from the milk of the rubber tree 'whisked up into a honeycomb of millions of interconnecting air cells'. This pillow will not 'bunch up' and, as it cannot create dust or fluff, it should be a special boon to all who suffer from asthma or hay fever. Issued in a standard size with white cambric cover, price 59s. 6d. Unfortunately, as first supplies must go to dollar markets, there may be some delay before the 'dunlopillo' appears in any quantity in this country. (The Dunlopillo Division, Dunlop Rubber Co. Ltd., Walton, Liverpool.)

BRITISH LEGION VILLAGE

THE Report for 1950-51 of the British Legion Village, Maidstone, Kent (perhaps better known as 'Preston Hall') draws attention to the facilities available there for ex-Service men. The *Rehabilitation Section* is available for the admission of tuberculous ex-Service men and women 'who need and are physically able to undergo post-sanatorium rehabilitation'. There is also an arrangement with the Regional Hospital Board whereby men and women may be trained in nursing and hospital work. Applications for admission should be made to the physician in charge of the local chest clinic in the area in which the man or woman lives. Patients who are at present in a sanatorium should ask their medical officer for advice. The *Sanatorium Section* is available for the admission of medically suitable ex-Service patients from all parts of the country through the Regional Hospital Board of the area in which they live. All communications concerning the admission of patients should be made through the physician to the local chest clinic.

NAPT CLINICAL CONFERENCE IN SCOTLAND

THE National Association for the Prevention of Tuberculosis will hold a Clinical Conference in the Art Galleries, Perth, on October 3 and 4, when the following subjects will be discussed: Choice of surgical methods in the treatment of pulmonary tuberculosis; antibiotics in the treatment of pulmonary tuberculosis; and the protection of nurses and medical students against tuberculosis. The fee for the course is two guineas, to be paid to Miss A. J. Weir, NAPT, 65 Castle Street, Edinburgh, 2, from whom further particulars may be obtained.

INTERNATIONAL CONGRESS OF PHYSICAL MEDICINE 1952

THE International Congress of Physical Medicine 1952, will be held at King's College Strand, London, W.C.1, from July 14 to 18 inclusive. Following this there will be a provincial tour from July 19 to 24, when visits will be paid to Oxford, Stratford-on-Avon, and Cambridge. Full particulars of the different scientific meetings are published in the April 1952 issue of the *Annals of Physical Medicine*, or can be obtained from the British Association of Physical Medicine, 45 Lincoln's Inn Fields, London, W.C.2.

NEW MEDICAL DIRECTOR-GENERAL OF THE ROYAL NAVY

SURGEON VICE-ADMIRAL K. A. I. MACKENZIE, C.B., B.M., B.CH., K.H.P., has been appointed to succeed Surgeon Vice-Admiral Sir Edward Greeson, K.B.E., C.B., M.D., CH.B., K.H.P., as Medical Director-General of the Royal Navy. Surgeon Vice-Admiral Sir Edward Greeson had held the office since 1948, and retired on April 28, 1952.

PUBLICATIONS

The Scientific Paper. By Sam F. Trelease. This excellent little book the second edition of which has just been published, can be strongly recommended to all authors of scientific articles. Its scope is accurately described by its subtitle—'How to prepare it. How to write it'. Literary and scientific (or medical) ability do not necessarily go hand in hand, as most editors know to their cost, but, as Mr. Trelease points out, 'proficiency in writing . . . can be gained through study and practice . . . The student should learn to write as accurately, clearly, and concisely as possible'. To achieve this aim he can have no better guide than this book. It not only tells him how to plan a scientific article, but also how to prepare it for publication, how to make his tables and illustrations so that they can be reproduced satisfactorily with a minimum of trouble to editors and printers, and how to correct proofs. It is a book which should be made compulsory reading for every potential author of a scientific paper, and we trust that heads of departments will take the necessary steps to make this possible. The life of an editor would be made much easier, the cost of production of scientific journals would be beneficially affected, and the long time-lag between acceptance and publication would be reduced. (London: Baillière, Tindall & Cox, 1951, price 20s.)

Rheumatic Diseases, prepared by the Committee on Publications of the American Rheumatism Association, whose Chairman is Charles H.

CONTINUED ON PAGE 650

GM 127

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SALICYLAMIDE 7.5gr.
CAFFEINE 1.0 gr.
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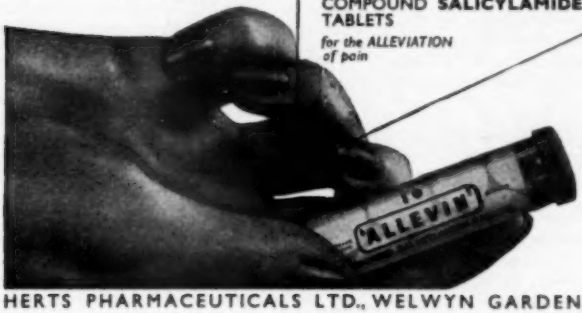
COMPOUND SALICYLAMIDE TABLETS
for the ALLEVIATION of pain



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Slocumb, M.D., is based on the proceedings of the seventh international congress on rheumatic diseases. Among the many different aspects of rheumatic diseases covered, there is a chapter on the use of cortisone and ACTH in rheumatoid arthritis and acute rheumatic fever by Philip S. Hench and his collaborators. (W. B. Saunders Company Ltd., 7 Grape Street, London, W.C.2, price 60*s*.)

Infective Hepatitis: Studies in East Anglia during the period 1943-47. By F. O. MacCallum, A. M. McFarlan, J. A. R. Miles, M. R. Pollock and C. Wilson.—It is becoming difficult to remember the critical importance of infective hepatitis during the late war, especially in the Middle East, where it was the most important medical condition from a military standpoint. This report covers work done then, and has perhaps appeared a little late. The epidemiological evidence is well mustered, and favours droplet spread. The evidence in favour of the existence of separate viruses in infective hepatitis and homologous serum hepatitis is a little thin; the report makes few references to histology. There is still a great deal to learn about infective hepatitis, a disease peculiarly of soldiers; it is to be hoped that if ever again misfortune should bring war, greater care will be taken to investigate this problem than was the case in military circles last time. (Med. Res. Coun. Spec. Rep. Ser. No. 273: H.M. Stationery, Office, price 4*s*. 6*d*.)

The British Hospitals Contributory Schemes Association (1948) has issued a Directory of Contributory Schemes for the year 1952, the first to be made public. The Schemes are listed alphabetically, with addresses and name of Secretary, and among the benefits are listed hospital cash benefit, convalescent home, rest breaks, and out-patient spa treatment for contributor and dependants, home helps, optical, dental, surgical appliances, specialist consultations, and private ward and nursing home treatment. (Royal London House, Queen Charlotte Street, Bristol, 1.)

British Journal of Radiology: Supplement No. 4. *Cancer of the Breast.*—A Review by D. W. Smithers, M.D., M.R.C.P., D.M.R., P. Rigby-Jones, M.B., D.M.R., D. A. G. Galton, M.B., D.M.R., and P. M. Payne, B.SC., from the Royal Cancer Hospital, London, it is divided into four parts dealing respectively with 'predisposing factors', 'factors influencing prognosis', 'results of treatment', and 'development of a treatment policy'. A method for calculating survival rates is given in an appendix, and there is a useful bibliography. (British Institute of Radiology, 32 Welbeck Street, London, W.1, price 20*s*.)

Rh Blood Groups and their Clinical Effects, by P. L. Mollison, A. E. Mourant, and R. R. Race, being Medical Research Council Memorandum No. 27, discusses the Rh groups generally, their clinical considerations, and Rh testing. Advice is given to parents of affected children regarding possible future pregnancies. The literature on this important subject has grown so bulky that this authoritative, concise summary of our present knowledge will fill a real need. (London: H.M. Stationery Office, price 3*s*.)

The Medical Directory 1952 again shows an increase in the number of medical practitioners registered—for 1951 the total was 69,672, and for 1952, 81,846. The 'late list' of new names and changes of addresses is longer this year and, although many are from abroad, this would seem to indicate some delay in notification by practitioners. The production, as usual, is excellent; the two volumes are a pleasure to handle. (J. & A. Churchill Ltd., 104 Gloucester Place, London, W.1, price 72*s*.)

Lloyd-Luke (Medical Books) Ltd. announce that they have moved into larger premises opposite the Middlesex Hospital. The address is now 49 Newman Street, London, W.1. The telephone number (LANgham 4255) remains unchanged.

OFFICIAL NOTICES

TERRAMYCIN.—The Ministry of Health, Department of Health for Scotland and the Ministry of Health and Local Government Northern Ireland announce that very limited supplies of terramycin will be made available from May 12, 1952. For the present, hospitals will be allowed to use it for the treatment of any conditions in which they think it suitable, but its use for domiciliary treatment will be limited to the conditions for which aureomycin is supplied to practitioners, i.e.:—

Suspected cases of ornithosis

Proved cases of undulant fever (brucellosis)

Lymphogranuloma inguinale

Severe cases of atypical pneumonia in which there is good reason to believe that the cause is a virus.

Distribution is through Regional Distribution Centres. Subject to availability, supplies for hospitals outside the National Health Service and for non-National Health Service patients will be obtainable from these centres on the understanding that the cost will be recovered by the Ministry of Health from the hospital or practitioner concerned.

THE PRACTITIONER: 50 Years Ago. See page 651

IT IS SIGNIFICANT THAT

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Every day more people — particularly those with sensitive palates — are finding how good it is to enjoy this fine cigarette knowing that nothing but cool, clean tobacco smoke can pass the filter tip. Here's a practical suggestion. Smoke du Maurier, and nothing else, for a week, **and see how well they suit you.**

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THE PRACTITIONER

Fifty Years Ago

'In general, it can be affirmed that problems are never ended: it is men who exhaust themselves in the problems'.—Ramón y Cajal.

JUNE, 1902

'THE Month' opens on a breezy note: 'For the two-thirds of a century during which it has been in existence the chief function of the University of London has been to supply a practical answer to the riddle, "When is a university not a university?" which might otherwise be as insoluble as the famous one propounded by Mr. Montagu Tigg: "Why is a man in jail like a man out of jail?" The idea of a university is a *studium generale*, an organisation for the teaching of everything knowable. The University of London has not taught; it has only examined candidates with whose training it had nothing to do. And therefore, though its degrees in some faculties, notably in medicine, have been highly prized, its name, unhallowed by traditions having in it no association either of fellowship in study or of early friendship, arouses in its graduates no more emotion than that of the Board of Trade or Somerset House . . . The first step towards the construction of a real University has now at last been taken by the incorporation of a University College, which brings with it into settlement, so to speak, a site, buildings, and equipment, with trust funds and other resources equivalent in all to about one million pounds. The University of London has therefore ceased to be merely an academic expression, and has become a concrete living body . . . It is thought to be not unlikely that King's College will also seek incorporation, though in its case, perhaps, the theological difficulty may stand in the way. It is an interesting speculation what is to become of the other affiliated colleges. If incorporation into the University can be purchased only at the price of a million pounds, most of them must perforce remain outside. And what is to become of the medical schools? . . . It is well known that, as things are, several of the metropolitan schools have a hard struggle for life; for them it is practically a question of being absorbed into the University or into the Infinite'.

'The new Warrant and the Regulations for admission to the Royal Army Medical Corps (continues the Editor) show a real desire on the part of the Secretary of State for War to make the service attractive to young medical men who prefer a military career, with its large opportunities of amusement and occasional excitement, to the humdrum routine of civil practice. He might have saved himself a good deal of trouble had he begun by looking for guidance in the right quarter instead of taking counsel with a Committee of distinguished persons possessing the most extensive and accurate knowledge of everything belonging to the domain of medicine —except the needs and conditions of the medical service of the Army. The Committee died in due course, unwept and unhonoured, and it is satisfactory that in this case it cannot be said the evil that men do lives after them . . . If the Warrant is on the whole a good one, it is because in essential points it is quite unlike their scheme'.

Sir John Pringle, M.D., F.R.S. (1707-1782)

The three 'Original Communications' on malignant disease of the uterus are from the pens of A. H. N. Lewers, Obstetric Physician to the London Hospital, C. Hubert Roberts, Physician to the Samaritan Hospital for Women,

FIFTY YEARS AGO—*continued*

and F. W. N. Haultain, Lecturer on Midwifery, Edinburgh School of Medicine.

Upon Sir John Pringle, 'the father of military hygiene' and the subject of 'Pioneers of Public Health', 'Royalty shed the light of its countenance abundantly. In 1761 he was appointed physician-in-ordinary to the Queen's Household, and in 1763 physician-in-ordinary to Her Majesty herself. In 1764 he succeeded Dr. Wollaston as physician-in-ordinary to the Queen. In 1768 he became physician-in-ordinary to the dowager Princess of Wales, and in 1774 he was appointed physician to the King . . . His fame rests mainly on his work on "Diseases of Armies", which went through a number of editions . . . The book is one of the classics of medicine'.

Recent knowledge of diseases of the kidneys is reviewed by Thomas J. Horder, M.D., M.R.C.P., Physician to Out-patients, Great Northern Hospital; Junior Demonstrator of Practical Medicine, St. Bartholomew's Hospital.

Among the books reviewed are 'The History of Ancient Gynæcology', by W. J. Stewart McKay ('One takes up the book with the delightful sense of indulging in a luxury; with the knowledge that it can serve no practical use, and that its *raison d'être* is purely literary and not commercial'); 'Outlines of Gynæcological Pathology and Morbid Anatomy', by C. Hubert Roberts; 'Uterine Fibro-myomata', by E. Stanmore Bishop; 'Uterine Tumours', by W. Roger Williams; 'Anatomical Atlas of Obstetrics', by Oskar Schaeffer; 'Menstruation and its Disorders', by Arthur E. Giles; and 'The Care and Feeding of Children', by L. Emmett Holt.

'Practical Notes' contain a somewhat drastic remedy for severe neuralgia, advocated by F. E. Waxham in the New York *Medical Record*—castor oil given in doses of from 1 to 2 oz. three or four times daily, 'although in some cases good results have been obtained with smaller doses. After the first two or three doses it usually loses its cathartic effects. We should guard against its too free cathartic action by sufficient doses of opium . . . as it is the constitutional, and not the local effect that it is desired to produce. It is best given . . . in milk with effervescing seltzer, or in ale, especially Bass's ale . . . The author urges the trial of this simple remedy, which has given results in neuralgia never before obtained by other medicines'. A method of distinguishing death from catalepsy 'has been submitted to the Academy of Sciences by Dr. Icard of Marseilles. He injects fluorescin . . . into the veins. A grain of the fluorescin solution will colour 45,000 litres of water. If there is any circulation, the body will turn grass green in two minutes, but the colour passes away in a couple of hours without doing any harm'.

W.R.B.

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There is now sufficient clinical evidence of the superiority of 'Mercazole' over all members of the thiouracil series. Not only is 'Mercazole' more quickly acting than these substances but it appears to be virtually non-toxic in therapeutic doses, permitting greater flexibility of dosage.

'Mercazole' is indicated in hyperthyroidism of all degrees including thyrotoxicosis. In severe cases it may be used to reduce the metabolic rate in preparation for operation. In milder cases it may be given as an alternative to surgery.

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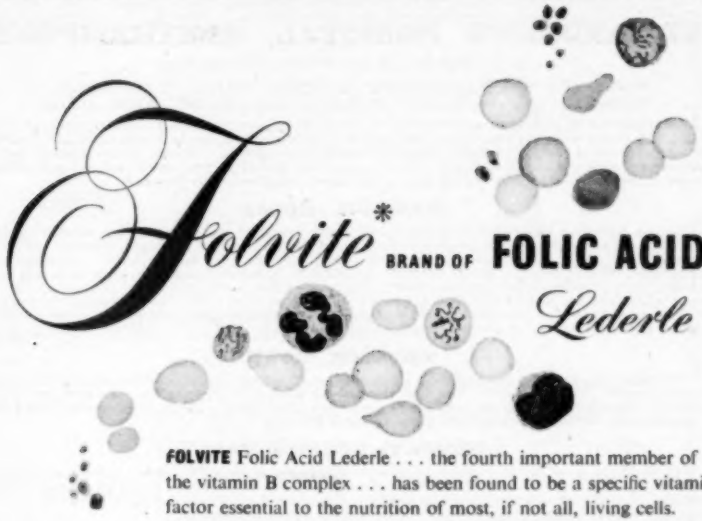

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FOLVITE is effective for the treatment of the haemopoietic and gastro-intestinal lesions of sprue ; and it improves promptly the blood picture in gestational macrocytic anaemia, macrocytic anaemia of gastro-intestinal origin and the macrocytic anaemias associated with malnutrition (including pellagra and similar deficiency states).

Whether given by mouth or parenterally, FOLVITE stimulates specifically the production of red blood cells, white blood cells and platelets. In pernicious anaemia, liver extract or vitamin B_{12} must be given.

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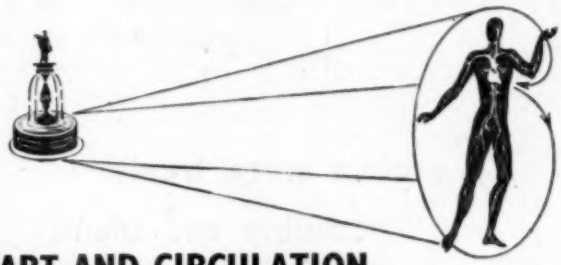

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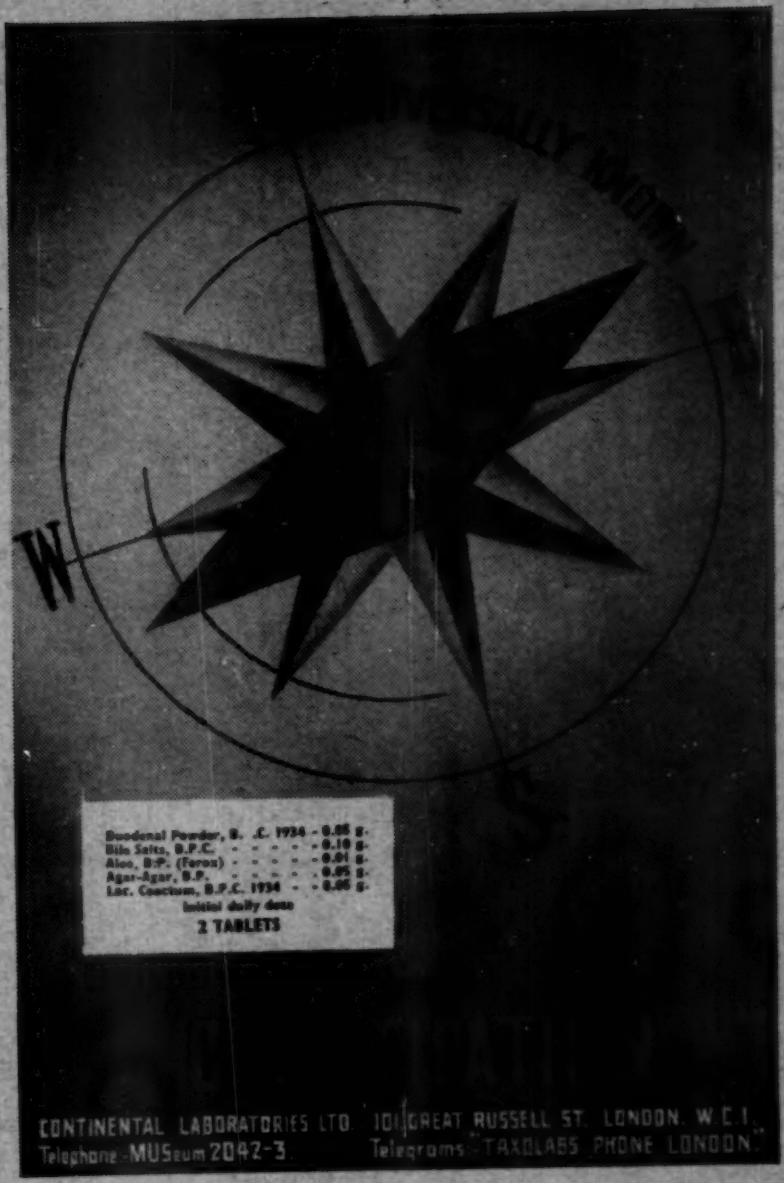
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